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AVIATION DIGEST

Army Aviation Medicine

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Cover: **This month the *Aviation Digest* pays tribute to and introduces Army Aviation medicine as a regular departmental feature. "Aviation Medicine—Its Origins and a Training Perspective" gives a historical overview of changes, discusses available training courses, and highlights the role of Dustoff, FLATIRON and the MAST Program. Story begins on page 2. Illustration by Paul Fretts.**

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Major General Ellis D. Parker
Chief, Army Aviation Branch

A New Approach to Training Army Aviators

NECESSITY IS truly the mother of invention...or, in the case of the Aviation Center, innovation. Recent decrements in dollars and resources are having a positive effect on many aspects of the Aviation Center's method of doing business, in that we are searching for, and implementing, ways of working smarter, more efficiently and more effectively. In the words of a recent computer company commercial, we are continually asking, "What if...?"

Until June 1988 the primary and instrument phases of initial entry rotary wing training were conducted in two different aircraft types: TH-55 Osage and UH-1 Huey. This meant using valuable training time for aircraft transition. Implementation of "Multitrack" in May 1988, with students beginning in the UH-1, has solved the transition problem. However, it will not overcome the fact that the UH-1, like the TH-55, is getting old and we fly our training aircraft hard. Maintenance is becoming expensive in terms of both time and money. We need a new bird.

In June 1987 the Army Aviation Center asked the U.S. Army Aviation Systems Command (AVSCOM) for an industry search to locate a replacement training aircraft for the UH-1 that would meet the needs of both primary and instrument training. To find out what industry had to offer, AVSCOM issued a request for information (RFI) in September 1987. The number of responses to the RFI indicated a high level of interest. AVSCOM evaluated the responses and found that, though no aircraft was currently available off-the-shelf that would meet all requirements, industry is capable of modifying an existing aircraft or designing a new aircraft to meet our training needs.

A request for proposal normally would be the next step, followed by the award of a contract for a replacement aircraft. However, with current and forecasted budget constraints, it did not appear that money would be available to fund development and acquisition of a totally new aircraft, especially in view of the small number required.

It was at this point that we asked, "What if...?" and a new concept emerged: a "turnkey contract." In this scenario the Army would contract for a total training package, wherein the contractor would provide the aircraft, equipment and support services necessary to produce a qualified, instrument-rated, rotary wing aviator, ready to enter his or her particular "track." The contractor would also design a program of instruction to train the students to the standards defined by the Army. The Aviation Center would provide the contractor with facilities, including space for simulators, with which to conduct the program. This modification would reduce the contract cost and keep the training within the Aviation Center complex.

We published an RFI in May 1988, describing our needs. Contractors normally specialize in either aircraft or training programs, but not both. Therefore, we considered it unlikely that a single contractor would be prepared to provide the total training package; separate specialized contractors would join forces to form organizations equipped to meet our modified turnkey requirement. The aviation contract community has served us extremely well in the past. We eagerly await their response to our newest challenge.

The modified turnkey concept has many advantages for Army Aviation. It provides a solution to the replacement aircraft problem without requiring the Army to own and maintain a low density fleet of training helicopters. It precludes the need for several individual contracts because the prime contractor will provide the training, all equipment and services. In addition, the use of Aviation Center facilities will reduce contract costs and allow the Army to monitor the program closely. Finally, both primary and instrument phases of training will be completed in a single aircraft.

The TH-55 and the UH-1 have served faithfully and well. If aircraft were given awards, each has earned the highest in valor and service. They will be retired from the Aviation Center training arena with grace and honor.

Their successor will be a technologically superior training aircraft that will be an integral part of a modified turnkey training contract—a program that will produce an instrument-rated helicopter aviator fully prepared to begin training in an assigned aircraft "track."

AVIATION MEDICINE REPORT
Office of the Aviation Medicine Consultant

Aviation Medicine

Its Origins and a Training Perspective

Major Dennis C. Story
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THIS ARTICLE contains excerpts from "Army Aviation Medicine" by Major Roland H. Shamburek and Colonel Spurgeon H. Neel, *Aviation Digest*, January 1963.

Army Aviation's success and medical readiness on the modern battlefield are directly related to an effective U.S. Army Aviation medicine program with the mission to ensure that our aviation community is fit to win!

The story of Army Aviation medicine might conceivably start during World War I when Major Theodore C. Lyster, Medical Corps, U.S. Army, was appointed the first chief surgeon, aviation section, Signal Corps, U.S. Army. As such, his contributions in the fields of physical standards, pilot selection, physical examination, research and specialized medical support for air units earned him the title of "Father of Aviation Medicine in America."

Army Aviation medicine cannot even claim the same birthday as Army Aviation. This is true because the 6 June 1942 memorandum, which made light aircraft organic to the Field Artillery, did not incorporate special associated medical support. The Army Air Forces provided this support along with many other activities.

In World War II, Army liaison pilots in combat noted, in many instances, that true aviation medical support could not be maintained because of the lack of readily available Army Air Forces medical facilities.

Even the establishment of an autonomous U.S. Air Force in 1947, and later its own medical service, did not result in the birth of the Army Aviation medicine program. Most qualified Army flight surgeons transferred to the Air Force and, under existing peacetime conditions, Army Aviation depended almost completely on experienced Air Force medical personnel for aviation medicine commitments. Actually, Army Aviation medicine cannot point to a specific memorandum or date and claim a birthday. The program materialized as the need for it grew.

The continued advancement of Army Aviation medicine can be traced to these pioneers. In 1950, Lieutenant Colonel Rollie M. Harrison was the only Army medical officer developing what could be considered an aviation medicine program, at Ft. Sill, OK. The Korean War proved to be a major factor in initiating the current concept of close aviation medicine support when tactical units were separated from major Air Force facilities. The Army recognized a need for Army trained aviation medical officers and sent Major Spurgeon Neel to the U.S. Air Force School of Aviation Medicine in 1952. Major Neel (now Major General retired) used information learned at the school to establish aeromedical evacuation policies in the Eighth Army, Korea. The success of this venture led to the establishment of the Army Aviation Section, on 6 November 1952, as a component of the Medical Plans and Operations Division within the Office of The Surgeon General (TSG), Department of the Army (DA).

Over the next few years, Army Regulation (AR) 40-110 (now AR 40-501, "Standards of Medical Fitness") that established standards for aviation physical examinations

Army Aviation medicine in the field environment.

illustration by Bill Dale

was published; however, the majority of flying examinations continued to be performed by the Air Force except at Ft. Sill. Army doctors knew little about the career potential of aviation medicine and were reluctant to sign up for the Air Force school. The Army Medical Field Service School at Ft. Sam Houston, TX, added aviation medicine instruction to its Military Medicine Course, followed by a short course at Randolph Air Force Base, TX, and then a 2-week practical orientation in aviation medicine at the Army Aviation School, Ft. Sill, to offset the lack of interest.

As Army Aviation continued to expand, requirements were established for an aviation medicine officer at each division, corps, field army, transportation helicopter battalion, and at major Army commands and schools. This recognition of aviation medicine spurred interest in the field.

In January 1953, Colonel Rollie Harrison at Ft. Sill assumed the first staff position as technical consultant to the director of the Department of Air Training on aviation medicine besides operating the flight dispensary. Colonel Harrison moved with the Aviation School from Ft. Sill to Camp Rucker, AL, in 1954. Aviation medicine had found a home.

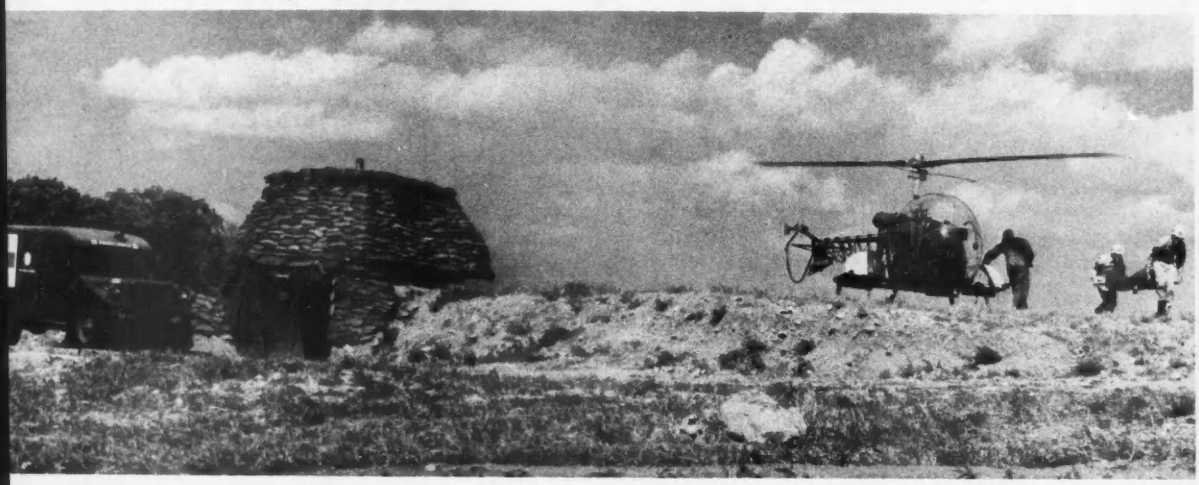
Aviation medicine has undergone many changes over the years, not without its problems; it has matured and progressed along with the Aviation School into an organization that is still dedicated to the same mottos that have stood proudly through the years. The medical mission to "Conserve the Fighting Strength," and the medical evacuation motto "Dedicated Unhesitating Service to our Fighting Forces—DUSTOFF," still ring true in the hearts of Army Medical Department (AMEDD) soldiers today.

The U.S. Army Aeromedical Center (USAAMC), Ft. Rucker, AL, and Lyster Army Hospital, named after Brigadier General Theodore C. Lyster, the Father of Aviation Medicine in America, are the mainstays of Army Aviation medicine. The USAAMC provides both consultative and personnel management services to DA as the home of the Aviation Medicine Consultant to The Surgeon General. It also comprises the U.S. Army Aeromedical Activity (USAAMA), and provides administrative and logistical support to the U.S. Army School of Aviation Medicine (USASAM) and the U.S. Army Medical Evacuation Proponency Division.

The USAAMA maintains a data repository on all Active Duty, U.S. Army Reserve (USAR), Army National Guard (ARNG) and civilian contract aviators who have ever had, or now have, a waiver or suspension from flight duties. The USAAMA recommends aeromedical elimination, suspension and waiver of flying duty status to higher headquarters. It provides worldwide aeromedical consultation services, and reviews more than 40,000 flight physicals each year.

"FLATIRON" is the hospital's air ambulance division based at Cairns Army Airfield; it has the primary mission of providing crash rescue and medical evacuation support of aviation training. FLATIRON also uses its UH-1 Huey

The Dustoff call sign originated in Korea.



helicopters to provide aeromedical evacuation and hospital transfers, and takes part in an active Military Assistance to Safety and Traffic (MAST) Program. In September 1987, FLATIRON completed its 1,000th MAST mission. About 2,500 flight hours are logged annually in support of the Ft. Rucker mission.

U.S. Army School of Aviation Medicine

The USASAM was established on 1 October 1984 when it became a branch school of the Academy of Health Sciences (AHS). Before that time the Department of Education and Training, USAAMA, had the mission of aeromedical training. Although the name may have changed over the years, USASAM's mission has remained constant: Provide the best aviation medicine and aeromedical training programs to U.S. Army Aviation personnel. Physically located in the USAAMC complex at Ft. Rucker, the USASAM trains about 8,102 students and provides more than 12,000 hours of classroom instruction each year.

Aeromedical subjects are contained in 25 U.S. Army Aviation Center programs of instruction (POIs). These POIs emphasize the vital role that aeromedical training plays in aircrew training. The USASAM facilities include three multimedia classrooms, a unique night vision room and a room containing both altitude and dive chambers. During fiscal year 1987, 339 hypobaric (altitude) chamber flights were conducted. These flights familiarized 3,035 students with the dangers and physiological limitations of man in the aviation environment. USASAM is also the proponent for three AMEDD POIs: The Army Flight Surgeon Primary Course, the Flight Medical Aidman Course and the Essential Medical Training for AMEDD Aviators Course (2CF7).

The Army Flight Surgeon Primary Course is a 7-week course of instruction taught three times a year for Medical Corps officers and physician assistants assigned to be unit-level flight surgeons. The course prepares them to deal with medical concerns unique to the aviation environment—physiological training, preventive medicine and clinical aviation medicine. This course is also available to ARNG, USAR and allied medical officers.

The Flight Medical Aidman Course is a 4-week program designed to teach medics with divergent backgrounds how to function as air ambulance aidmen. The students receive classroom instruction as well as hands-on medical and rescue training in both the UH-1 and UH-60 Black Hawk helicopters. The course is offered 4 times a year with 39 students in each class. The course is open to Active Duty, ARNG and USAR enlisted personnel with the 91A or 91B military occupational specialty in the grades E3 through E6.

The hypobaric chamber at the U.S. Army School of Aviation Medicine, Ft. Rucker, tests reactions to high altitude flight.

The USASAM is a unique multidisciplinary blend of aviation and medical personnel ready to assist the Army in overcoming its aerospace challenges on the future battlefield.

U.S. Army Medical Evacuation Proponency Division

The U.S. Army Medical Evacuation Proponency Division advises the commandant, AHS and TSG on all medical evacuation proponency matters. It assists in development and review of medical evacuation policy, guidance and regulations. It serves as liaison between AHS, USASAM, USAAMC, the Aviation Center and field organizations for medical evacuation matters. It also monitors and facilitates action for all medical evacuation matters pertaining to doctrine, equipment, organization, training and personnel. This division administers medical evacuation proponency programs by assisting in managing all phases of the personnel life cycle management model and conducts the aviation medicine portion of the U.S. Army Training and Doctrine Command and U.S. Army Forces Command aviation resource management surveys.

The aviation medicine report is a monthly report from the Aviation Medicine Consultant of TSG. Please forward subject matter of current aeromedical importance for editorial consideration to U.S. Army Aeromedical Center, ATTN: HSXY-ADJ, Ft. Rucker, AL 36362-5333.

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AMEDD AVIATION UPDATE

NO, YOU DON'T have to be an Army Medical Department (AMEDD) officer to be a medical evacuation (MEDEVAC) pilot, but it helps. Who wants to fly a helicopter into a hot landing zone (LZ) without any guns—potentially endangering the lives of four crewmembers not to mention an aircraft priced at more than a million dollars—to evacuate a wounded soldier and perhaps save a life? Someone different! Transporting a wounded soldier is quite a bit different from hauling beans or bullets. Someone like Major Charles Kelly who, during the Vietnam conflict, while under hostile Vietcong fire, and after being cautioned to depart the hot LZ, disregarded his personal safety to evacuate casualties. Major Kelly's last words were "not until I have your wounded." Major Kelly was the detachment commander. He always will be remembered for his heroic effort and his dedication to the MEDEVAC mission. He fought many long, hard political battles to keep his unit free from any administrative support missions so that MEDEVACs could be his sole and dedicated duty. He believed that the soldier deserved his beck and call. He would not tolerate anyone or anything interfering or distracting his unit from being constantly on alert to respond, day or night. For this important reason, when Army leaders decided to create an Aviation Branch, all the aviators from a number of basic branches were pulled in to the newest Army branch, except one—the Medical Service Corps (MSC) aviator. The MSC remained separate, diverse and distinct. The MEDEVAC mission was considered too important and specialized to receive anything other than a separate billing. This feeling still prevails throughout the Aviation Branch and the AMEDD.

Yet, while the MSC aviator is considered a separate entity in many respects, the MSC also is an integral part and contributing member of the Army Aviation team. (See

illustration by Paul Fretts

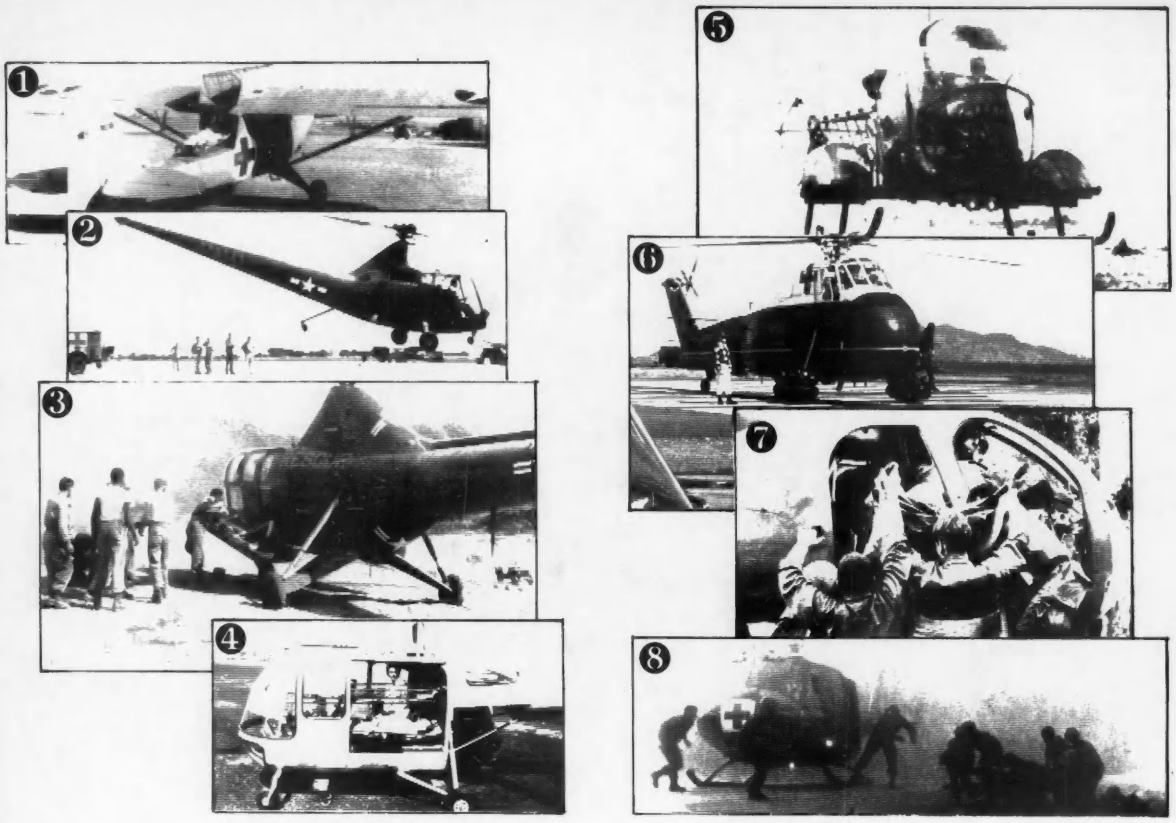
"Separate but not Apart, AMEDD Aviation," *Aviation Digest*, September 1985.)

The Aviation Branch continues to lead the way in aviation standardization, combined arms training and doctrinal publication. This zealous effort has continued in full force from the inception of the Aviation Branch. Just as the Aviation Branch forges onward in its endeavor to be the finest branch, AMEDD aviation and AMEDD aviators strive to match the Aviation Branch step-for-step in their quest for excellence. Currently, AMEDD aviation has launched several major initiatives to develop new MEDEVAC doctrine, training standardization, force structure development and the exploitation of future technologies.

The most significant AMEDD initiative was the establishment of a Medical Evacuation Proponency Division. This division was set up at the direction of The Surgeon General (TSG). It is a component part of the Academy of Health Sciences (AHS) and is located at the U.S. Army Aviation Center, Ft. Rucker, AL. This vitally important element interfaces with all Army Aviation Branch activities. Committed to remain an "aviation team player," it ensures that AMEDD aviation remains abreast of current aviation concepts, training doctrine, knowledge of combined arms tactics and force structure developments.

AMEDD aviation initiatives, as well as those of the Army Aviation Branch, are most exciting. Other current AMEDD aviation initiatives include:

- Development of new tables of organization and equipment for MEDEVAC units. This effort consists of a massive reorganization of Vietnam era companies and detachments into more effective companies consisting of 15 aircraft per company. This reorganization will enable the AMEDD to provide far better and more flexible MEDEVACs within a theater of operations. This type of support will keep the evacuation lines flowing smoothly while supporting the AirLand Battle 2000 concept.
- Creation of a list for standardizing medical equipment on MEDEVAC aircraft by the Directorate of Combat Developments (DCD), AHS. From this list, a medical equipment set, national stock number 6545-01-141-9476, was developed for MEDEVAC units. The implementation of this initiative will aid in standardizing aircraft medical equipment configurations for all units despite their support requirements or location.
- Evaluation by the AHS DCD of a proposal to establish a precommand course for MSC officers selected to command aeromedical evacuation units. This initiative should enhance the knowledge base of our future commanders

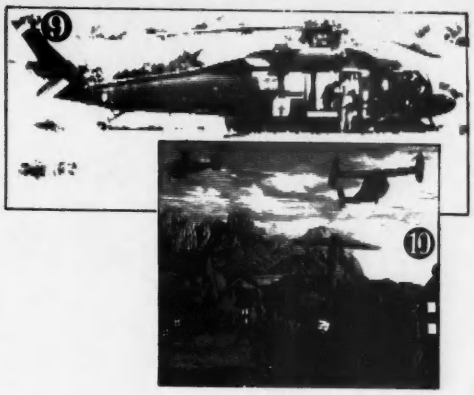


and arm them with all the necessary tools to ensure maximum unit effectiveness.

• Development of new doctrine and tactical guidance for an effective air and ground evacuation system that is compatible with the expected casualty flow generated by Air-Land Battle 2000 combat operations. Doctrine will include guidance on techniques such as MEDEVAC support of cross-forward line of own troops operations. Recently, the Medical Evacuation Proponency Division published Field Circular 8-45, "Medical Evacuation in the Combat Zone," designed to assist evacuation unit commanders and aviators in techniques for maximum effective ground and air casualty evacuations. A publication of this type was sorely needed in the past and is now available through the assistance of the AMEDD Medical Evacuation Proponency Division.

• Development of specific aircrew training manual (ATM) iterations required for aviators performing the MEDEVAC mission. An example of the type of maneuvers to be described would be passive air-to-air defense flight techniques for aeromedical evacuation helicopters. This will create the long needed standardization of flight maneuver training requirements basic to all MEDEVAC units regardless of the type of line unit supported. Continuity will be established so that an aviator performing MEDEVAC training at Ft. Bliss, TX, will understand the same basic concepts as an aviator performing MEDEVAC training in Europe.

• The Army's Medical Research and Development Command, through two of its laboratories (Aeromedical Research and Biomedical Research and Development) will evaluate, test and certify medical equipment to be used while inflight on U.S. Army aircraft. Previously, U.S. Air Force personnel at Brooks Air Force Base, TX, assessed Army aeromedical equipment. That arrangement resulted



AIRCRAFT USED IN MEDICAL EVACUATION

FIGURE 1: HE-1 in early days of medical evacuation.

FIGURE 2: R-6 brought in wounded in Philippines in 1945.

FIGURE 3: H-5 rescue helicopters used in Korea.

FIGURE 4: TH-18 evaluated as medical vehicle in 1949.

FIGURE 5: In 1950 H-13s sent to Korea.

FIGURE 6: CH-34s used in Vietnam.

FIGURE 7: OH-6s also used in Vietnam.

FIGURE 8: UH-1s became the workhorse in Vietnam.

FIGURE 9: In Grenada UH-60s were on standby for MEDEVAC.

FIGURE 10: MEDEVAC mission will be a vital requirement of the Army's future aircraft capabilities.

in prolonged evaluation times and difficulty in tracking equipment. This initiative will enhance the Army's capability to assess new equipment for use in-flight and, therefore, improve the quality of care that can be rapidly provided to the soldier. Besides military specific items of equipment that will be evaluated under this program, peacetime Military Assistance to Safety and Traffic (MAST) items of equipment that provide lifesaving medical care to civilians on Army aircraft, also can be evaluated.

AMEDD aviation is also extremely active in research and development (R&D) activities involving future airframes and equipment. For example, the MEDEVAC mission has been added to the required operational capability (ROC) document for the light helicopter experimental (LHX) project. It is envisioned that the MEDEVAC version of this machine will be able to transport four litter patients and two ambulatory patients besides the two pilots, crewchief and, of course, the indispensable medic. Although the utility version of the LHX project has been scrubbed, should it be resurrected, the MEDEVAC mission has been identified.

A six-litter configured carousel is currently being acquired to replace the existing four-litter configurations in the UH-60 Black Hawk. This initiative will enhance the patient load limits for the Black Hawk. A kit to provide heat to the rear compartment of the Black Hawk (the patient) is also being acquired.

The AMEDD is in its final stages of evaluating an external rescue hoist to be mounted on MEDEVAC UH-60 helicopters. This hoist will not only aid in more effective rescue operations, but will also free considerable room inside the aircraft currently occupied by the present internally installed hoist. Besides taking up internal cabin space, the current internal rescue hoist installation requires that the litter pans on the hoist side of the aircraft be removed. This will cut the already limited patient load by 50 percent (down to 2). It would seem that this initiative, coupled with the 6-litter carousel and rear cabin heater, will significantly enhance the MEDEVAC mission capability of the UH-60.

Perhaps the most exciting R&D project being undertaken by the AMEDD is development of the MEDEVAC package for the V-22 Osprey tilt rotor aircraft. The deputy commander, U.S. Army Medical Research and Development Command, Brigadier General Richard T. Travis, accepted the challenge to ensure the MEDEVAC version of this extremely versatile machine will be fully capable of performing Army MEDEVAC missions. The V-22 project, under the control of the Department of the Navy, is in its full-scale development phase. Thousands of parts have already been manufactured. Therefore, modifications to the design of the airframe itself, solely to facilitate MEDEVAC needs, are not physically or financially feasible. The AMEDD's task has, therefore, been difficult in that the MEDEVAC package must be compatible with what already has been designed on the aircraft. Army leaders recently elected to obtain overt commitment to the V-22 project. The AMEDD was programed to receive 64 V-22 Ospreys to field into new tilt rotor MEDEVAC companies. These companies would support a corps area and conduct high-speed (potentially up to 300 knots) evacuation of wounded soldiers to hospitals located within the corps rear area and perhaps into the communications zone. Should this very versatile machine someday become an asset to the U.S. Army as a combat service support vehicle, the AMEDD will be ready to configure it for the MEDEVAC mission.

Indeed, things are exciting for Army Aviation and AMEDD aviation alike. It's always a great day to be a soldier, but an even better day to be an aviator!

Captain Ann S. Freed
77th U.S. Army Reserve Command
Public Affairs Office
Fort Totten, NY

THE INSCRIPTION surrounding the winged horse on the patch worn by the helicopter safety inspector, Staff Sergeant Jeffrey A. Shipiro, reads "Flight for Life." SSG Shipiro was making sure that the UH-1 Huey sitting on the airfield at Camp Powderhorn, Honduras, was ready to evacuate a Honduran child brought to the camp hospital the previous evening in a near coma.

The safety inspector is a member of the 336th Medical Detachment, an air ambulance unit under the 77th U.S. Army Reserve Command at Ft. Totten, NY. The patch is a distinctive insignia created by a former unit member, Sergeant Rhonda Denney. The "Pegasus" patch appeared often during Fuertes Caminos, a road building exercise being held from last November through June in North Central Honduras.

The close-knit emergency medical team was in Honduras this past winter through early summer on a twofold mission: to support the soldiers working on the road and to provide humanitarian aid to the Hondurans affected by the new road.

"Flight for Life," said Shapiro. "We live up to the inscription. At Camp Powderhorn we enhance the whole hospital process by allowing people to be evacuated to where they have a chance to survive."

Camp Powderhorn, named after the insignia of the 11th Engineer Group of West Virginia, was the headquarters for the exercise named Fuertes Caminos or Strong Roads. It was the final increment of a 3-year effort to connect the villages of Yoro and Jacone with a farm-to-market road.

The exercise, which began as Blazing Trails in 1985, was conducted at the invitation of the Honduran government, and in conjunction with Honduran soldiers. Until this past year only Honduran military police were working alongside their American counterparts to provide base security. But during Fuertas Caminos Honduran and American Army engineers also worked side-by-side on the road building project that was sometimes dangerous.

The Newburgh, NY, air ambulance unit was there to support the soldiers when the call came in that a convoy had been involved in an accident. The ever-ready emergency medical team consisting of two pilots, a crewchief and two medics, scrambled to the helicopter, and arrived on the scene within minutes. The soldiers on the scene were frantically searching for the driver of a 5-ton truck. The vehicle had been thrown into a pit when a mudslide caused the road to collapse. The driver apparently had been thrown from the truck.

The medics got as close to the scene of the accident as possible by helicopter. They then raced to the site of the collapse, rappelled into the pit on safety lines, and began conducting systematic search patterns. "[SSG] Dave Barkley found him halfway down the mountain buried in mud. He was dead," said Staff Sergeant Hector Torres, who also was involved in the rescue effort.

In a situation like this, the skills of the air ambulance team include psychology, according to SSG Torres. "We defused the situation by communicating with everyone involved. We communicated with *everybody* so that no one does anything unsafe," he said.

But most of the time, according to SSG Shapiro, the team saves lives. "The general idea is to get everyone, including the crew, out of there alive."

Like all the participants in Fuertas Caminos, the air ambulance has another mission: humanitarian aid. The 336th has helped the hospital teams by providing air ambulance support to local civilian hospitals when there was a medical problem that needed attention at a more fully equipped hospital.

The life of the 4-year old Honduran boy, who was brought into the camp hospital by his grandmother during that second week in February, may have been saved by the 336th's evacuation of that child to a hospital. The grandmother, Ortilia Sala, carried him to the base camp in her arms, having walked 2 hours, barefoot, through rough jungle terrain.

According to base camp doctors, the child, Oscar Sala, had been taken with severe seizures that left him nearly unconscious. Tests were performed in the hospital. He was released, and his grandmother took the smiling child home a few days later.

If the medical evacuation unit had not been there, the grandmother would have walked to Yoro, the nearest town with a hospital: a journey of 7 hours on foot.

SSG Torres told another story. During one of their medical support missions, an old man handed him a medical appointment card. The card was for the man's 4-year old daughter, born with a cleft palate. The card authorized the child's evacuation to the hospital in Palmerola for an operation. The father, who couldn't read, didn't know what to do. He also was very frightened because he had never flown. Torres, who speaks fluent Spanish, was able to explain the evacuation procedure to the man and persuade him to fly with the child to the hospital. Torres told the man, "You will fly through the heavens to Palmerola." According to Torres, the man, who was moved to tears during the flight, said "I have a beautiful country."

U.S. ARMY SAFETY CENTER

Enforcement of Standards Key to Safe Aviation Units

AVIATION UNITS in which clear, practical standards are established and enforced have fewer accidents. In a survey of three organizations with exceptionally good safety records—a combat aviation battalion, an air cavalry squadron and an aviation battalion—enforcing standards was the key to successful training and operations. Each unit had a different organizational structure and mission. Yet, in each unit,

Commanders—

- Established clearly defined performance criteria and ensured all personnel were aware of them.
- Established training standards and conducted training to those standards.
- Planned flight missions well and carefully selected crews.
- Took immediate and effective enforcement action against violators of proper flight discipline, which—
  - Reinforced self-discipline.
  - Created an awareness of intolerable behaviors and of the consequences of any deviation from proper flight discipline.
- Possessed strong leadership and management abilities, had technical aviation knowledge and were highly involved in the appointment process for pilots in command (PCs).
- Established individual training as high priority for flying-hour usage.

Senior aviators—

- Helped train inexperienced aviators in by-the-book operations.
- Accepted responsibility for policing their own.

Aviators—

- Took pride in the fact that their units conducted flight operations by the book.
- Felt the title PC was a status earned instead of automatically given. The selection process considered input from other PCs, leaders, instructor pilots and aviation safety officers.
- Demonstrated a high degree of professionalism in their duties.

Noncommissioned officers (NCOs)—

- Showed strong leadership in maintenance operations. Not only were maintenance NCOs personally competent in technical skills, they supervised their personnel, made on-the-spot corrections and emphasized by-the-book operations.

• Never sacrificed quality for quantity in maintenance operations.

Command actions

In all of the units, command involvement was emphasized throughout the entire organization. Safety was not considered an "add-on" to training but was permanently integrated into training so that it had become a normal way of doing business.

The following command actions were key elements in managing each of these organizations:

- Performance criteria were established.
- Personnel were aware of the performance criteria.
- Training was conducted to a standard.
- Operations were performed by the book.
- Effective actions were taken against deviations from established performance criteria.

This last point was not something only commanders were concerned with. There was a pervasive sense of professionalism and awareness in these units that would not allow unnecessary risk-taking to go unnoticed or be tolerated. "Tough caring" is not always easy, but it works, as demonstrated here, when it is practiced not just by leaders but by everyone in the unit. When tough caring does not exist, and unnecessary risk-taking is tolerated or condoned, it will likely continue. When undisciplined actions are allowed to continue unchecked, a new standard has been set—the lowest standard—the one that causes accidents.

In units where people are self-disciplined and caring enough to see that others don't take unnecessary risks, tough, realistic training can be conducted with a high degree of safety. It can be done by using a risk-management approach—a smart decision-making process that sets operational parameters for a particular operation before it takes place and identifies and weighs the risks against the overall training value to be gained. Risk management is not a way of getting around accomplishing the mission. It is a way to accomplish the mission with the least risk possible.

We do not have to choose between tough, realistic training and safety. We can maintain a high state of readiness with a high degree of protection for our warfighting resources by:

- Training to standard.
- Making sure standards are known and achievable.
- Having leaders who enforce standards and individuals who follow them.
- Permanently integrating safety into carefully planned operations based on sound risk-management decisions.

U.S. Army Class A Aviation Flight Mishaps

	Number	Flying Hours	Rate	Army Fatalities	Total Cost (in millions)
FY87 (through 15 June)	26	1,143,221	2.27	26	$53.0
FY88 (through 15 June)	23	1,202,417*	1.91	38	$51.7

*estimated

PEARL'S

Personal Equipment And Rescue/survival Lowdown

Points Often Repeated

Because the following often repeated points are important, and should be practiced, they warrant reiteration:

- If a helmet visor is worn properly, the crewmember wearing it is protected from objects that may penetrate the eyes.
- If a survival radio is worn and properly secured, it serves as a useful tool in a rescue.

Note: Remember—even a million dollar piece of equipment isn't worth a plugged nickel if it isn't worn or used properly. It must be readily available for immediate use when needed.

Let us hear some good points from you users and commanders. We will publish them in PEARL'S.

Broken Communications

Note the often-repeated points above and try relating them to the following:

A UH-1 Huey went into autorotation. The pilot in command (PC) shut the fuel down, flared to slow the helicopter's autorotation and entered the trees. The aircraft settled vertically, cutting trees as it fell. It brought down branches and leaves on top of it as it fell. The impact was level and hard. All occupants sustained injuries.

The PC did not have his helmet visor down. During the descent through the trees, a 3-inch-long twig entered his left eye cavity, penetrating the left frontal lobe of his brain.

The survival radio, lying on the floor, was thrown out on impact; its antenna was broken off. This situation presented a serious rescue problem.

Covered with debris from its fall through the trees, the helicopter was nearly invisible from above. In an attempt to aid in their rescue, the crew "popped" smoke grenades to mark their location. However, because of the dense jungle canopy and calm air, only a thin wisp of smoke coiled upward. Fortunately, the crew of another Huey saw the smoke and the crew was rescued.

Yes, such accidents can happen to the best crew.

SPH-4 Helmet Designed to be Worn Without a Chin Pad

Using a chin pad with the SPH-4 helmet will greatly decrease the likelihood that the helmet will be retained during a crash sequence. Even with a snug fitting chin strap, the pad will compress, permitting enough space for the helmet to slide off the head. *No helmet means no head protection*. Without a helmet, the human skull has the survival potential of a "watermelon in an elephant burial ground." A little mild discomfort may be the difference between life and maiming, misery or even death; the choice is yours.

AR 95-17, "The Army Aviation Life Support System Program"

A recent message, R 291504Z, HQDA, WASH DC APR 88, authorizes further delay in totally complying with paragraph 2-9b pertaining to survival radios. The PC will continue to ensure that not less than one fully operational survival radio is onboard the aircraft. This does not preclude crewmembers from carrying additional survival radios onboard the aircraft. In addition, the PC will ensure that crewmembers without survival radios have other signaling devices; i.e., L119 foliage penetration flare kit and/or a signaling mirror. The HQDA point of contact (POC) is Ms. Rosalie Coleman, DALO-AV, AUTOVON 227-0489. We hope that we will soon have sufficient survival radios so we can stop giving waivers.

Microclimate Conditioner Systems (MCSs)

The U.S. Army and other defense agencies are involved in developing MCSs to provide comfort to aircrewmembers wearing the nuclear, biological and chemical (NBC) protective clothing. The types of MSCs now being evaluated by the Army include both air- and liquid-cooled systems. In the air-cooled system, the crewmember wears an "air vest" under the overgarments. In operation, the ambient air is first filtered and then cooled in an external cooling unit, and is passed to the air vest. About 12 ft^3/min of air is blown across the neck and torso region of the body. The air-cooled system is an open loop system.

In the liquid-cooled system, crewmembers wear a "liquid vest" that consists of parallel and/or series channels used to circulate the chilled liquid in close contact with the skin. An appropriate liquid (for example, a propylene glycol and water solution) is chilled in the external cooling unit and is then passed to the liquid vest. The system operates in a closed loop; the warm water leaving the vest is returned to the cooler for rechilling. We are looking for-

ward to this new cooling system technology that will benefit our aircrew personnel.

Medical Materiel Disposition Instructions

A message from the commander, U.S. Army Medical Materiel Agency (USAMMA), advised that materiel cataloged under national stock number 6505-01-137-8456, chigger repellent and antipruritic lotion, 4 fluid ounces, manufactured by Pierson, should be destroyed. The reason for the need for destruction is that the materiel failed the Food and Drug Administration test. Please note that only *expired* chigger repellent should be destroyed. Materiel that has not expired is considered suitable for issue and use. SAILS ABX 88Q-1002 applies. This information should be passed through command channels to medical staff sections, supply officers and supported activities. USAMMA will confirm this information in Department of the Army Supply Bulletin 8-75 series. The POC is T. Bess, SGMMA-OC, AUTOVON 343-2045.

Radio Set AN/PRC-112

We know you have been looking forward to receiving more information on the AN/PRC-112 survival radio, so here are a few tidbits. Deliveries of this radio to the New Cumberland Army Depot are scheduled to begin in December 1988. The radio will be used for total package unit materiel fielding to special operating forces during the second quarter of fiscal year (FY) 1989. Initial production award of the radio set personnel locator is AN/ARS-6(V)1 (UH-1); AN/ARS-6(V)2 (UH-60A); AN/ARS-6(V)3 for installation and use in the MH-47E, UH-60K and other specially configured aircraft equipped with a MIL-STD-1553 data bus. More information will follow as it becomes available. Should you require additional information, we suggest you contact the U.S. Army Avionics Research and Development Activity, ATTN: SAVAA-C, Ft. Monmouth, NJ 07703-5000.

Oxygen Mask, MBU-12/P Pressure Demand

These masks are being procured in gray color to match the color of the HGU-55/P helmet. They are now available to the field. However, the green mask will be used until it is exhausted. The POC is Jose S. Casas, AUTOVON 945-6831.

Aircrew Integrated Helmet System HGU-56/P

Technological advances in the development of Army Aviation NBC, armament, fire control, and direct energy devices have resulted in the need for various aircrew helmet configurations. To preclude the proliferation of helmet designs within the logistics system, a need for an improved, versatile aircrew helmet system was identified. This system should provide a materiel solution to the Army Aviation Mission Area Analysis deficiency.

The new helmet should provide the capability for effective integration of all devices and equipment required for the aviation mission. It will be worn in Army aircraft that may operate worldwide during all weather conditions, day or night, and during all modes of flight, including terrain and nap-of-the-earth. It will adapt to in-flight and dismounted operations, as required by the mission. The helmet will be lightweight; provide a degree of ballistic protection, including spall; incorporate a lower helmet or head center of gravity; improve impact and noise attenuation characteristics; and will be developed as a modular helmet system. Laser eye protection will be incorporated into the helmet's visor or the aviator's spectacles.

As more information becomes available, we will keep you updated. The POC is Mr. Herbert Lee, AMCPM-ALSE, AUTOVON 693-3573.

Helicopter Oxygen System

A helicopter oxygen system is required for helicopters and aircraft located in areas whose terrain and/or mission functions necessitate sustained high-altitude flight. AR 95-1, "Army Aviation: General Provisions and Flight Regulations," and AR 95-17, "The Army Aviation Life Support System Program," direct that aircraft crews and occupants on unpressurized Army aircraft must use oxygen on flights above 10,000 feet pressure altitude (PA) for more than 1 hour and on flights above 12,000 feet PA for more than 30 minutes. All aircraft occupants must use oxygen on any flight above 14,000 feet PA for any length of time.

The lack of oxygen systems for observation, utility and cargo type helicopters curtails the mission capabilities and responsibilities of selected Army and Army National Guard aviation units. Many of these units are called upon numerous times each year to perform missions at high altitudes; some conduct search and rescue (SAR) missions. SAR operations often exceed 15,000 feet in Alaska. Installing an oxygen system in these aircraft will enable the aircrew to properly train and to perform the required mission or rescue of other personnel. This will improve the mission capability in the interest of safety and Army Aviation mission performance. The helicopter oxygen system is scheduled to be funded in FY 1989.

If you have a question about personal equipment or rescue/survival gear, write PEARL'S, AMC Product Management Office, ATTN: AMCPM-ALSE, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798 or call AUTOVON 693-3573 or Commercial 314-263-3573.

MONTHLY WRITING AWARD

It's Cancer!

...were the last words I expected to hear from the doctor. "What happens now?" I asked. "Your life will change a great deal."

CW3 Kelley Dragon

SEVERAL YEARS ago when I was a 27-year-old instructor pilot (IP) at Ft. Rucker, AL, I was sent to Ft. McClellan, AL, for surgery to remove a cyst from my right leg. All the signs and X-rays up to then had indicated a benign condition—a calcified cyst in a muscle of my thigh. Even during surgery, it had not appeared to be anything else.

I spent 5 days in the hospital, then was released on convalescent leave. The next 2 weeks were great. I dropped in on my grandparents, worked on my suntan and visited my little brother at Ft. Campbell, KY. With great expectations for my future, I zoomed back to Ft. McClellan for my final checkup. Already I was anxiously looking forward to my new job, a standardization instructor pilot (SP) at 9th Battalion, Lowe Army Heliport.

When my appointment came up, I walked into the doctor's office, eager to get his "blessing" and my discharge papers. I wanted to go back to work! He started out with some curious questions: had I had any pain in my lymph glands, did I ever feel dizzy, any health problems out of the ordinary?

"Nothing wrong," I answered. Of course not, I thought; I'm in great shape, and I don't smoke (anymore) or drink (anymore).

"Kelley," he said, "you didn't have a cyst, like we thought you did. During the biopsy, we found that it's cancer."

All of a sudden, I felt like a person who wakes and is not sure where she is. I had the awful thought, "Please be kidding me." I wanted that doctor to laugh, to say it was only a joke. He didn't. I realized I could do several things: refuse to accept it, give way to my emotions and cry right there, or

stay calm and get on with the business of living.

"What happens now?" I asked.

"Your life will change a great deal," he said. "You'll go to Ft. Gordon, GA, today. There, you probably will go through more surgery, very likely chemotherapy and radiation, too."

"What will happen to my flying, my career?" I was desperate to know; for some reason, concern about living or dying had become secondary. To fly, or not fly, was all that mattered. The answer was worse than I expected.

"I don't know exactly, but there is the possibility you will be medically retired—either permanently or for a period of years. Even if you are kept in the service, you may not fly again. So much depends on what type of cancer you have, and how well you respond to treatment. If you fly, it may not be for several years."

While the hospital staff worked to get my travel orders prepared, I tried to gather my thoughts. Just a half hour before, I had felt like I had the world by the tail. I was unstoppable; I was going places! Now I was going to Ft. Gordon for an undetermined period of time. The possibilities of Germany, the instrument flight examiner (IE) course and promotion to CW3 were evaporating.

Once I got to Ft. Gordon, I became part of the medical community and the masses of patients who are seen each day there. Eisenhower Army Medical Center (EAMC) is a huge place, providing a wealth of services to an incredible number of people.

At first, there was not much to do with me except sign me in, assign me a bed and schedule me for tests. All that took 3 or 4 days. Although my doctor was sure I would require surgery, he didn't want to commit himself until he saw my biopsy for himself. Considering what was at stake—my leg—I could appreciate his concern. After all, what if it turned out *not* to be cancer, and they had already....

A bone scan, CAT scan of my lungs and X-rays all came out clear, indicating that the disease probably had not spread. I was counseled by the orthopedist, and the cancer specialists, known as oncologists. They told me what to expect from each of the treatments I was likely to receive. Everyone answered my questions candidly; I never felt as though they were holding information back that I asked for. I found it helpful to have an idea of what to ask—the more specific my question, the more specific their answer.

In the meantime, my mother had come up from Florida to spend some time with me. Fortunately, she's my best friend, and we were able to talk seriously about what was happening to me. We discussed the possibility of my disease being fatal; what if I lost my leg; what if I were retired from Active Duty; what in the world was I going to do with the rest of my life? In the end, we realized the most important thing was not whether I lived or died, but how well I lived the rest of my life.

The nurses on my ward introduced me to a woman—younger than me—who had the same type of cancer and

It's Cancer!

was almost through with her treatments. If she hadn't told me she wore a wig, I would not have known. Jo Ann was a great help to me in coping with the immediate details of where and how to buy a wig, what it was like when your hair came out and the effects of chemotherapy and radiation.

My surgery was in the morning, about 1100 hours. Although I'm told it was several hours, it seemed like it was only a few moments later I woke up in the recovery room, sick, different than before. And the difference was just the beginning.

For 2 days after my surgery, I was in a fog. I remember nurses coming in at all hours of the day? night? to tend me. They were incredible, wonderful. People who were nice to me when I didn't feel like being nice to anyone: A Reserve Officer Training Corps cadet nurse on the night shift who would bring ice for my leg all the time, all the privates and lieutenants who made a very dreary time of my life a lot better.

From the start, I had decided one thing—I would not be a mental cripple. No matter how much the surgery took, no matter whether I walked with my own legs, or artificial means, *I was going to walk again*. Seven days after my surgery, I was doing just that, no crutches.

I had lost the muscle that had confined the cancer, and a lot of the surrounding muscle and skin. Because I was in such good shape before the surgery, I healed quicker, walked sooner and was in better spirits than most of the patients around me. I know my physical conditioning was a very important factor in enduring that summer.

All too soon, the day of my first chemotherapy arrived. I was more afraid of this than anything I'd encountered in my adult life.

The first is the worst. Not knowing what will happen is terrifying; all the preparation in the world doesn't begin to match up to reality. But when the first one is over, you're through with it, until the next treatment. Then it's not so bad. You learn ways to keep yourself detached from what is happening to your body.

I was not as badly affected as most cancer patients. Each month, for 5 months, I went to chemotherapy. Even though I was receiving strong drugs, I was only sick for 2 days at the most, then I was ravenous the rest of the time. I was able to function normally for all but the immediate hours after my treatment.

My hair started coming out 11 days after the first chemotherapy. This was one test of courage I avoided in my own way. I went to a barber and had all my long hair cut very short. Then I went back to my room and shaved it off; much easier to do with short than long hair. On went the wig, and I looked normal again. Even with the large numbers of cancer patients at EAMC, it was not feasible for the hospital to have their own radiation facilities. Many of us were treated at a civilian center associated with one of the medical colleges in Augusta. Every weekday, I went across town to receive 200 rads of energy on a specific area of my leg. It eventually totaled 7,000 rads. The only respite I got was a 2-week break to allow my leg to heal a bit. Otherwise, the radiation damage would have exceeded the benefits of continuous treatment.

Up to now, it sounds like I had a miserable existence in the hospital. In reality, except for the few truly rotten days, there was a lot to be done. The hospital had a good library, a learning center with computers; I worked on my correspondence course, and crocheted. No, I didn't like being there. But I made it as bearable as I could. A lot of people were worse off than I was.

The support from friends, and my chain of command was priceless. My family came up to see me; friends called, wrote or visited when they could; and my battalion commander kept tabs on me through my section leader, calling the hospital to arrange for a chaplain to make special visits.

As a soldier with a major disease, the Army had to decide what to do: keep me or medically retire me? I wanted to stay in, which was important, but it was only a part of the overall view. My oncologist wrote a medical summary of my disease, the treatments, statistics on survival and whether or not I would be of any use to the Army. After a long wait, I got my answer—retained on Ac-

tive Duty. It made all the loneliness worth the effort.

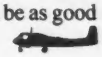
In September 1985, I finished my radiation and returned to Ft. Rucker. I still had to go back to Ft. Gordon twice to finish the chemotherapy, but the worst was over. My next hurdle was getting back on flight status.

I'd always had the sneaking suspicion that you never won with a flight surgeon; the best you could do was break even. I found I was wrong. Flight surgeons aren't looking for ways to ground aviators. They are looking for ways to ensure healthy aviators keep flying. Or start flying again. Aviator medical criteria are similar to, but tougher than, the Army's on suitability. After all, if you have a seizure from a tumor while at your desk, it's not as disastrous as having one when you are flying.

My records went before the Aviation Medical Review Board after the last chemotherapy. Recommendations from all the doctors who treated me were considered along with my medical history. The decision took into account my ability to perform as an IP, survival rates, likelihood of cure, personal desire and professional background.

After what seemed like forever to me (in reality, only a few weeks), the board ruled in my favor: returned to flight status.

It is now a year and a half later. I am flying again as an SP. My hair has grown back!!! The dream of being an IE has become a reality, and I'm eligible for the next CW3 board. Germany is still in the future; but at least there is a future, and it will be as good as I make it.



COMMENTARY

Cancer in young people is exceedingly rare; extremity cancer, no matter what variety, is even rarer. Because of excellent training at large medical centers, most Army surgeons have a great deal of experience with cancer—even of the extremities. For this reason, the diagnosis is nearly always considered as a possibility, yet rarely diagnosed. In fact, the average orthopaedic surgeon will diagnose perhaps only two primary malignant tumors of the bone and extremities *in his or her entire career.*

A number of lessons are to be learned from these facts and those presented in this article. First, the vast majority of "lumps and bumps" are *not* cancer. Second, survival rates with most cancers in young people are steadily improving, thanks to earlier diagnosis and improved treatment. Here, the Army Medical Department is on the leading edge of technology and treatment protocols at the large medical centers such as Eisenhower Army Medical Center as mentioned in this article. Third, that the Army flight surgeon's role is to support the aviator. When the rare diagnosis of cancer is made, and treatment is successful, the flight surgeon's goal is to return that aviator to flying status if at all possible.

One last plea—if you have any concern about a particular "lump or bump," or for that matter, any medical concern at all, seek advice from your local flight surgeon. Again, he or she is there to support *you*.

Major James P. DeHaven
Orthopaedic Surgeon/Flight Surgeon
U.S. Army Aeromedical Center

ABOUT THE AUTHOR

CW2 Kelley Dragon was assigned to the Aviation Training Brigade, U.S. Army Aviation Center, Ft. Rucker, AL, when she wrote this article. She has since been promoted to CW3 and awarded Senior Aviator Wings.

CW3 Dragon is currently assigned as an instructor pilot to Headquarters and Headquarters Detachment, 5th Battalion, 158th Aviation Regiment, APO New York.

USAASO SEZ

Department of Army Regional Representatives

Mr. John McKeeman
U.S. Army Aeronautical Services Office
Cameron Station, Alexandria, VA

OVER THE YEARS you may have heard of someone called a Department of Army Regional Representative (DARR) but never knew what they accomplish in life. That's the purpose of this article, to give you a thumbnail sketch of the DARRs assigned to our office.

Officially, the DARR functions, area covered, addresses and phone numbers are contained in chapter 1 of AR 95-50, "Airspace and Special Military Operation Requirements." In a word, the DARR provides service to Army activities within the geographical area of the Federal Aviation Administration (FAA) region to which they are assigned. The service provided falls into three general areas: Aviation matters, airspace and air traffic control (ATC). Of the three, the aviation matters function probably keeps DARRs the busiest. The DARR can get you an FAA interpretation of the Federal Aviation Regulations (FARs); check out flight violations and incidents; coordinate Army Aviation activities requiring regional approval such as paradrops, night vision goggles training, vertical helicopter instrument recovery procedures, etc. So if you need help with any aviation matter give your friendly DARR a call. Their phone numbers are published in the Army Aviation Flight Information Bulletin (Technical Bulletin aviation 1-series).

The airspace area is one of great importance these days. The FAA is responsible for managing the nation's airspace, a resource that is becoming scarce as more and more users want their fair share. The Army uses airspace for ATC purposes (control zones, etc.) as well as special use airspace (SUA) for conducting activities that may be hazardous or incompatible with nonparticipants. Hazardous activities include such things as firing artillery, firing aircraft weapons, detonating old munitions, test firing production munitions, conducting tests of new weapons systems, etc. Most of our hazardous activities are conducted in SUA called restricted areas. When we use these restricted areas, other users are denied access to that airspace, much to their discontent. That's where the DARR comes in by handling airspace matters for you, the Army user. The DARR is your initial point of contact to obtain, modify or return airspace in coordination with the FAA, so if you are in aviation, range control, or ATC, and you have any question concerning the National Airspace System (NAS), contact your DARR.

ATC is the third function of the DARR office. The DARR is staffed with two ATC experts, a warrant officer (military occupational specialty (MOS) 150A) and a senior noncommissioned officer (MOS 93C). The DARR office is a direct interface between Army ATC facilities and the FAA region. Such things as the interpretation of the ATC procedures handbook, review and updating of facility letters of agreement and the appointment of control tower examiners are within the capabilities of the DARR office. Once again, you ATC folks give the DARR a call if you need some assistance.

Besides the foregoing duties, DARR personnel work closely with the Aeronautical Information (AI) Division of the U.S. Army Air Traffic Control Activity Aeronautical Services Office (USAATCA-ASO) to ensure that information needed by Army aviators is contained in the Department of Defense (DOD) Flight Information Bulletin (FLIP). They can assist aviation units and facilities on how to request, develop and update instrument approach procedures as well as update information currently in the DOD FLIP. DARR personnel validate facility information currently in the FLIP products. They ensure that FLIP account holders understand how to verify information for products as well as how to obtain appropriate products to support unit missions. DARR personnel can provide units and facilities with background information and assistance on all AI products.

Last, DARRs are truly DA representatives. They are appointed by The Adjutant General of the Army and have a direct line of communication to the Office of the Deputy Chief of Staff for Operations and Plans through the director, USAATCA-ASO. They are there to provide service to you; please use them.

Specific questions concerning the DARR offices should be directed to Mr. John McKeeman at AUTOVON 284-7796/6304 or Commercial 202-274-7797/6304.

USAASO invites your questions and comments and may be contacted at AUTOVON 284-7773.

Major George A. Alexander, M.D.

Smoking Effects on Army Aviator Performance

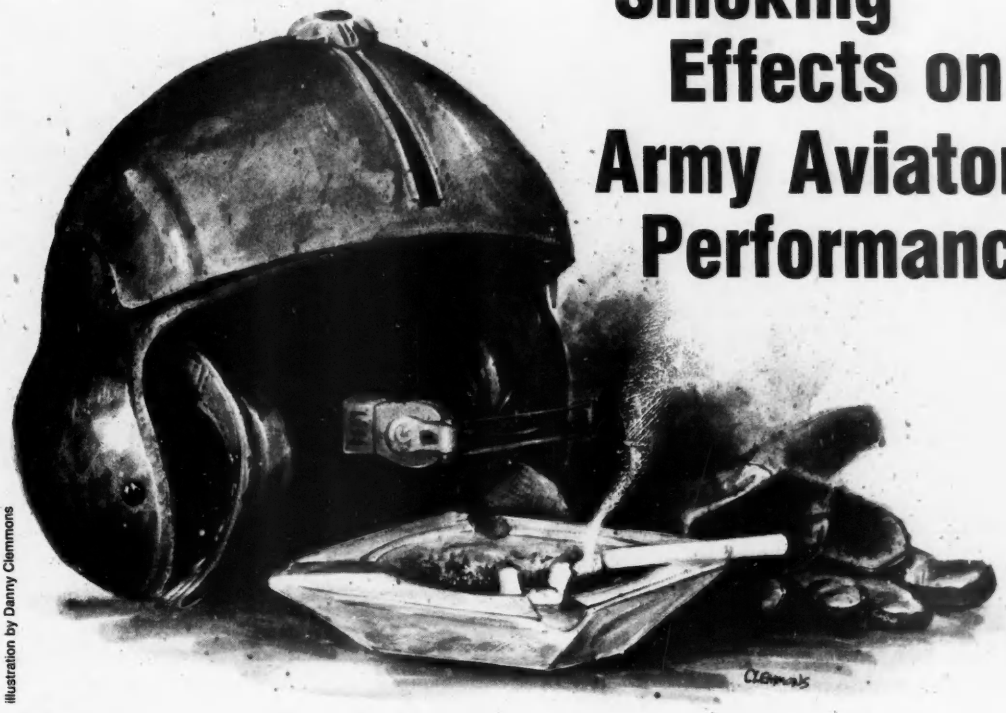


illustration by Danny Clemmons

THE REPORT TO the U.S. Surgeon General on *Smoking and Health* in 1964 generated much concern over the impact of smoking on public health.[1] In general, U.S. military personnel are more likely to smoke than the general population.[2]

In 1986 in an effort to reduce the number of smokers, the U.S. Army began an antismoking campaign. This program prohibits smoking in Department of Army buildings and facilities except in areas properly ventilated and designated as smoking areas.

According to recent surveys 41 percent of Active Duty Army personnel smoke. This percentage is considerably less than the 52 percent who smoked 2 years ago.[3] In keeping with this antismoking campaign, it behooves all of us in the Army Aviation community to be aware of and understand the potential harmful effects of smoking on Army aviator performance. This article discusses these adverse

[1] U.S. Department of Health, Education and Welfare. *Smoking and Health*. Report of the advisory committee to the Surgeon General of the Public Health Service. Washington, DC, U.S. Government Printing Office, 1964.

[2] John, J. F. "Smoking, the Soldier, and the Army." *Military Medical 1977*; 142:393-398.

[3] Kimble, V. "Smokers Dwindling in Military, Survey Finds." *Army Times*, 23 November 1987, p. 45.

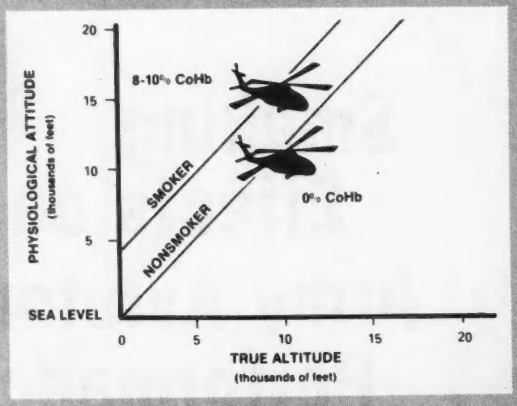


FIGURE 1: Comparison of a smoker's and a nonsmoker's true and physiological altitudes.

The detrimental effects of tobacco on health are well known. Apart from the long-term association with lung cancer and coronary heart disease, there are other important, but less dramatic, effects. The chronic irritation of the lining of the nose and lungs caused by tobacco increases the likelihood of infection in these areas. To aviators, this problem is more than a nuisance because it affects their ability to cope with the effects of pressure changes in the ears and sinuses. Also, even a mildly irritating cough causes distress when oxygen equipment is used.

Emphysema and lung cancer are two of the many long-term effects of smoking. However, the aviator should be just as concerned about the acute effect of carbon monoxide produced by smoking tobacco. Carbon monoxide combines with hemoglobin to form CoHb. Carbon monoxide attaches to hemoglobin

effects. It also highlights a new program to help you, the Army aviator, kick the smoking habit.

Causes of impairments

Burning tobacco in cigarettes, cigars or pipes produces carbon monoxide (CO) as one of the major gaseous components of smoke. CO is a colorless, odorless gas produced by the incomplete combustion of organic matter. Smoke from one cigarette can contain up to 21,400 micrograms of CO. Inhalation of this poisonous gas into the lungs reduces the smoker's mental and physical abilities.

For an aviator, smoking can affect flight performance. The debilitating effects of smoking are multiplied at high altitudes. Medical evidence shows:

- Smoking causes massive intake of CO into the body.
- CO deprives the body of needed oxygen.
- Smoking-related levels of CO affect vision, timing estimation and coordination.
- The stressful nature of a helicopter pilot's job need not be complicated by the compromising effects of CO.

Hemoglobin, the chemical in the red blood cells that carries oxygen from the lungs to body organs and tissues, combines 210 times more readily with CO than it does with oxygen to form carboxyhemoglobin (CoHb). CO also impairs hemoglobin's ability to release oxygen into the bloodstream. All cells and tissues in the body need oxygen to function. Smokers usually have blood CoHb level ranges of 4 to 5 percent compared with 0.5 to 2.0 percent for nonsmokers—*about eight times greater!*

Adverse effects

Vision and other perceptual processes are critical to helicopter pilot performance. Smoking-related visual deficits that can occur include:[4]

- Slower dark adaptation.
- Lower levels of visual sensitivity to dim lights.

molecules 200 to 300 times more readily than oxygen does. The net effect is a degree of hypoxia from this increase in carbon monoxide that affects peripheral vision and dark adaptation. Average cigarette smokers have about 8 to 10 percent CoHb in their blood. This adds about 5,000 feet of physiological altitude (figure 1). Cigarette smoking causes decreased night vision. A nonsmoking pilot begins to experience decreased night vision at 4,000 to 5,000 feet of altitude because of the hypoxia; but a smoking pilot starts out with a physiological night vision deficit of 5,000 feet. Even more important, the smoker has lost about 20 percent of the night vision capability at sea level. Figure 2 compares reduced night vision at varying altitudes for smokers and nonsmokers. Figures and information are from Field Manual 1-301, "Aeromedical Training for Flight Personnel," May 1987.

percentage of reduction in night vision

ALTITUDE (FEET)	NONSMOKER	SMOKER
4,000	SEA LEVEL	20
6,000	5	25
10,000	20	40
14,000	35	55
16,000	40	50

FIGURE 2: Comparison of reduced night vision at varying altitudes for smokers and nonsmokers.

- Changes in the focusing process of the eye.
- Visual acuity.

The first two of these deficits appear to be associated with CO and increased blood levels of CoHb.[5] In a recent Army study, dark adaptation times were found to be more than twice as long for smokers as for nonsmokers.[6] The eye's ability to focus on objects at different distances is also impaired with smoking. At very low levels of illumination, smoking appears to influence central vision acuity.

All of these visual deficits have a greater significance when dealing with tactical night flying missions. The Chief of the Army Aviation Branch also stresses the importance of vision and night flying safety.[7] More research, however, is needed to further investigate the immediate and long-term effects of smoking on the eye.

Again, it has been shown that other significant impairments in helicopter pilots' performance that can result from smoking are in:[8]

- Time estimation.
- Judgment.
- Coordination.
- Ability to cope with stress.

The blood of high-altitude flying pilots who smoke has a decreased oxygen-carrying capacity, which renders these pilots more susceptible to the above impairments. The potential aeromedical dangers of high altitude flying have

[4] Dyer, F. N. *Smoking and Soldier Performance : A Literature Review*. U.S. Army Aeromedical Research Laboratory Report No. 86-13, 1986, pp. 1-223.

[5] McFarland, R. A. *The Effects of Exposure to Small Quantities of Carbon Monoxide on Vision*. Annals of the New York Academy of Sciences 1970; 174:301-312.

[6] Young, H. R., and Erickson, J. S. *Effects of Combat Vehicle Interior Light Colors on Dark Adaption and Detection by Night Vision Devices*. U.S. Army Tank-Automotive Research and Development Command Laboratory Technical Report No. 12485, 1980, pp. 1-24.

[7] Parker, E. D. "Fly Safer at Night." *U.S. Army Aviation Digest*, 1987; 1-87-2, p. 1.

[8] Dyer, F.N.

been reviewed recently in the *U.S. Army Aviation Digest*.[9] In view of the high performance standards of Army Aviation, these impairments are unacceptable in aviation combat, support or training operations. Army Regulation (AR) 95-1, "Army Aviation: General Provisions and Flight Regulations," requires the use of oxygen on flights above 10,000 feet for more than 1 hour.[10] Adherence to this regulation fortuitously protects those aviators who smoke!

New treatment program

Army aviators must be aware of the harmful effects of smoking. Then they can decrease these odds impairing the ability to meet mission demands quickly and effectively in a crisis.

If you smoke, consider quitting. Your local medical facility can help you choose a smoking cessation program. Recent studies show that 9 out of 10 smokers are concerned about their life-threatening habit; they would quit if they could find a way that works.

To encourage Army Aviation personnel to stop smoking the U.S. Army Aeromedical Center at Ft. Rucker, AL, has established a policy that allows flight surgeons to treat flying personnel electively with nicotine chewing gum.[11] The goal of treatment is total cessation of smoking with minimal disruption of flying duty. Before prescribing nicotine chewing gum, your flight surgeon will evaluate your motivation to stop smoking to judge the likelihood for success. He also will discuss several aspects of treatment, which include:

- Role of nicotine gum in the smoking cessation effort.
- Absolute requirement for total smoking abstinence while using nicotine gum.
- Correct technique for chewing the gum to avoid excessive nicotine dosage.
- Possible side effects.
- Flying duty restrictions while under treatment.

Once you begin using the nicotine gum, you'll be medically restricted from flying for 72 hours. After this period, if you have successfully abstained from smoking and are experiencing no side effects that would affect flight safety, you will be given an "up-slip" (DA Form 4186). The up-slip will allow you to return to full flying duty (FFD) with the following restrictions:

- Nicotine gum is being used to stop smoking.
- Use of nicotine gum is not allowed while flying despite aircrew duties.
- Smoking is absolutely forbidden at all times.

If you should indulge in a single episode of smoking, the FFD clearance becomes void. You will be medically restricted from flying until cleared by the flight surgeon. A person using nicotine gum should be followed by the flight surgeon at frequent intervals to monitor success of treatment. The first return visit should be within 14 days, with subsequent visits at 30-day intervals. Over the course of 3 months, the dose of nicotine gum should be tapered. Use of gum should never exceed 6 months' duration.

ABOUT THE AUTHOR

Major George A. Alexander is presently assigned to the 28th Combat Aviation Brigade, 28th Infantry Division, Pennsylvania Army National Guard, as brigade flight surgeon. Since 1979 he has served as a medical officer in the Army National Guard in various assignments in the District of Columbia, Texas and Maryland.

Major Alexander is a graduate of the U.S. Army Medical Department Officer Basic Course and the Basic Flight Surgeons Course. He also has completed the Combat Casualty Care Course, the Medical Effects of Nuclear Weapons Course and the Techniques of Special Operations Course. He is both airborne and air assault qualified. He has been awarded the U.S. Army Expert Field Medical Badge.

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[9] Moloff, A. L. "High Altitude, High Danger." *U.S. Army Aviation Digest*, 1987; 1-87-2, pp. 6-10.

[10] U.S. Army Regulation 95-1, paragraph 2-15.

[11] U.S. Army Aeromedical Center. *Nicotine Gum as an Adjunct to Smoking Cessation for Aviation Personnel*. USAAMC Policy Letter No. 22-85, 1 January 1985.

AVIATION PERSONNEL NOTES

Branch Qualification

Branch qualification criteria for aviation commissioned officers were reviewed during March of this year and resulted in a few changes. Aviation Branch qualification is now defined as graduation from a resident advanced course and one of the following:

- Successful company/detachment command.
- Successful platoon leader in those platoons authorized captains as platoon leaders (e.g., 15C, D, E and CH-47 Chinook units).
- Instructor or writer of aviation tactics or doctrine at the Aviation Center or other branch school.
- Instructor pilot at the Aviation Center.

These changes will be reflected in the next updates to both Department of the Army (DA) Pamphlet 600-3, "Commissioned Officer Professional Development and Utilization," and the Army Aviation Personnel Plan.

New Area of Concentration (AOC) for Aviation Commissioned Officers

On 16 February 1988, Headquarters DA approved Aviation Branch's proposal to establish AOCs by type mission. Shown below is a listing of the old and new Area of Concentrations.

Old AOCs	*New AOCs*
15A—General Aviation	15A—Aviation General
15B—Combat Aviation	15B—Aviation Combined Arms Operations (Air Assault)
15M—Combat Intelligence Aviation	15C—Aviation Tactical Intelligence
15S—Combat Communications Aviation (ATC)	15D—Aviation Logistics
15T—Aviation Logistics	15E—Aviation Tactical Communications (ATC)

The old system was in existence before branch implementation and was designed to provide proponent affiliations (e.g., 15S proponent was the Signal Corps) for aviation. Additionally, there was little discernible difference between old AOCs 15A, B and C.

The U.S. Army Soldier Support Center is currently implementing the new AOCs within the Army Authorization Documents System, and they should be reflected on unit documents soon.

Military Occupational Specialty (MOS) 93P Revision

On 13 April 1988, the Deputy Chief of Staff for Personnel (DCSPER), Lieutenant General (LTG) Allen K. Ono, approved an MOS proposal revising MOS 93P, Flight Operations Coordinator. This proposal changed the MOS title to Aviation Operations Specialist, giving a clearer definition of the soldier's duties. The standards of grade authorizations also have been changed, significantly reducing the tables of distribution and allowances (TDA) authorizations at the sergeant first class (SFC) through sergeant major (SGM) levels while increasing the tables of organization and equipment (TOEs) sergeant (SGT) and staff sergeant (SSG) authorizations. This action will eliminate the long-standing bottleneck in SGT and SSG promotions. Other changes include the provisions to use sergeant where only one 93P is authorized and to provide clearer instructions on grading TDA airfield operations positions.

NCO Reunion

On 5 and 6 August 1988, the Second Biennial United States Army Aviation Center Noncommissioned Officers Reunion for active duty and retired personnel will be held at Ft. Rucker, AL.

Activities planned for the "Let's Get Together For Old Times' Sake," affair include a welcoming party, picnic and a reunion social. Preregistration is suggested, but not mandatory.

Preregistration forms, hotel accommodations list and additional information concerning the reunion can be obtained by calling CSM Rufus L. Lloyd, AUTOVON: 558-3725/3173, Commercial 205-255-3725/3173 or writing to the NCO Reunion, P.O. Box 24, Ft. Rucker, AL 36362.

Systematic Training Evaluation:
The Graduate Questionnaire Program Revisited

Mr. William A. Rowe
Directorate of Evaluation and Standardization
U.S. Army Aviation Center
Fort Rucker, AL

WE PUBLISHED an article in the September 1985 *Aviation Digest* DES Report to the Field, titled "Questionnaires." The article discussed the purpose and procedures for a graduate questionnaire program that had been initiated by the U.S. Army Aviation Center, Ft. Rucker, AL. Evaluation of the questionnaire data began in February 1986. Since then, we have reviewed responses and generated formal evaluation reports pertaining to the majority of instructional programs at Ft. Rucker. The time seems right, therefore, to review the questionnaire program and to consider what has been accomplished.

Background

The Aviation Center graduate questionnaire program was developed to collect information about the quality and applicability of our training. The twofold goal of the program is to determine if our training programs are still relevant to the needs of the field and, if they are, to determine if recent graduates are able to perform the tasks and jobs for which they are trained.

The questionnaire strategy that we selected provides us with feedback from the graduate and from an individual in the receiving unit who is in the best position to judge the graduate's performance. For aviators, we choose to address the graduate's unit instructor pilot. For nonaviators, we survey the graduate's immediate supervisor.

The questionnaires have two sections. The first requests some general background data on the graduate's current status in the unit. The second section contains a list of tasks relating to the graduate's training. Graduates are asked, based on unit experience, to indicate how well prepared they feel they are to perform each task. Unit instructor pilots (IPs) or supervisors are asked to indicate, based on their observations, how prepared the graduate is to perform each task. Individuals are chosen to participate in the questionnaire program through the random selection of about 10 percent of our graduates. The questionnaire packets are mailed out 5 months after the graduate has completed training.

Results

To date, we have evaluated the accumulated responses to questionnaires for the following:

- Initial entry rotary wing (IERW) training program.

• CH-47 Chinook, AH-1 Cobra, UH-60 Black Hawk, AH-64 Apache and OV-1 Mohawk aviator qualification courses (AQCs).

• Rotary Wing Aviator Refresher Training Course.

• A90 Fixed Wing Multiengine Qualification Course.

• Entry training programs for flight operations coordinator, air traffic control tower operator and air traffic control radar operator military occupational specialties.

The aim of our questionnaire analysis is to surface indications of areas within our training programs that may require revision or some fine tuning. Data relating to four of the programs yielded such indications. So far, based upon data from the questionnaires, indepth evaluations of specific areas of the IERW, the AH-1 AQC, the A90 Fixed Wing Multiengine Course and the Flight Operations Coordinator program of instruction are considered necessary.

We have conducted the indepth evaluations through systematic interviews in the field. Both face-to-face and telephonic interviews have been employed, with the latter proving to be the most efficient and economical. As with the questionnaire strategy, the interviews were conducted with a random sample of the recent graduates and their IPs or immediate supervisors, as the situation required.

The detailed information obtained through the interviews (in keeping with the systems approach to training model followed within the Army's Training and Doctrine Command schools) allowed us to identify specific areas in the training programs that needed improvement. Internal evaluation of those areas through reviews of the presentations, supportive material and testing ultimately led to the changes that were necessary.

Conclusions

The field's response to this program has been outstanding. An average rate of return has been far above that normally expected for mailed questionnaires. Moreover, many individuals who were unable to respond called and explained their situations to us on the telephone. Such behavior illustrates a high degree of professionalism and team spirit within our aviation community. We are doing our utmost to match that commitment.

We have been expanding the questionnaire program to address new programs of instruction that have been created at the Aviation Center. We are also busy updating existing questionnaires to keep pace with changes that have been made to courses that were a part of our original effort.

We hope that those of you who have responded to the Aviation Center graduate questionnaire program are aware that your input can make a difference. For those of you who have not yet had a chance to take part, we look forward to including you with the many who have already contributed to the evolution of the Aviation Center's training programs.

DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362-5208; or call us at AUTOVON 558-3504 or Commercial 205-255-3504. After duty hours call Ft. Rucker Hotline, AUTOVON 558-6487 or Commercial 205-255-6487 and leave a message.

Managing Nonoperational Aviators

Lieutenant Colonel Jimmy A. Norris
Aviation Staff Officer
U.S. Army Health Services Command
Fort Sam Houston, TX

ONE OF THE seemingly most misunderstood requirements within the Army Aviation community today concerns nonoperational aviators. This conclusion is based on my evaluation of the aviation medicine programs throughout the country. As a member of both the U.S. Army Forces Command and the U.S. Army Training and Doctrine Command Aviation Resources Management Survey teams, I have reviewed nonoperational aviator management at many installations. None have been in total compliance with regulatory guidance.

What is a Nonoperational Aviator?

A nonoperational aviator is an Army aviator who is qualified for aviation service, but who is serving in an assignment in which basic flying skills are not kept current while performing assigned duties; i.e., assignment to a nonaviation duty position. This includes all Aviation Branch officers, except for aviation warrant officers with a primary military occupational specialty of 151A or 150A, who are not serving in a position requiring the maintenance of flying skills.

What are the Requirements?

The requirements are simple. First, the individual flight records folders (IFRFs) of nonoperational aviators must be kept in an inactive file with operational aviator IFRFs or with military personnel records as specified by major Army commanders. So states Army Regulation (AR) 95-1. This regulation also requires each aviator to present his or her IFRF to the unit to which assigned within 14 working days after reporting for duty.

A message was received from the commander of the U.S. Total Army Personnel Agency (formerly Military Personnel Center), DAPC-EPA-MP, 071530Z January 1986, subject: DA Form 3513, Individual Flight Records Folder, United States Army. This message stated that AR 640-10 would be changed to delete the statement permitting the IFRF to be kept by the military personnel records office. Therefore, the IFRF of nonoperational aviators should be kept by the installation aviation officer or his designee.

The following excerpts from current ARs define the second requirement:

- All Army aviators who are in aviation service (AR 600-105) must meet the annual physical requirements of AR 40-501, regardless of assignment. (See AR 95-1, paragraph 1-8b.)
- Army officers who enter aviation service must continually maintain medical and professional standards. (See AR 600-105, paragraph 3-1a.)
- All Army aviators, regardless of component or status and who maintain a pilot status code 1 must maintain current class II flight physical standards. (See AR 600-105, paragraph 3-1a.)
- Unless disqualified for aviation service by written order, all rated officers (except standby-reserve) must pass a flight physical each year, in accordance with AR 95-1 and AR 40-501. Assignment to a nonaviation duty position, or failure to meet gate requirements, does not exempt an officer from this requirement. (See AR 600-105, paragraph 3-9c.)
- DA Form 4186, Medical Recommendation For Flying Duty, is required for aviators in nonaviation duty positions. (See AR 40-501, paragraph 10-26j(5).)

What is the Problem?

Most installations do not have procedures for identifying nonoperational aviators. These officers are not presenting their IFRFs to the appointed custodians. Since these aviators are not identified, commanders are not monitoring compliance with the requirements. In many cases nonoperational aviators do not complete the annual flight physical examination. Most of those who do complete the physical examination do not have the DA Form 4186 reflecting compliance filed in their IFRFs. Many of these same aviators continue to receive Aviation Career Incentive Pay (ACIP). The local finance and accounting officer must certify annually that aviators remain qualified to receive ACIP. Obviously, this certification is being made without ensuring its validity.

What are the Consequences?

Beyond the obvious result of not having fully qualified aviators to press into service, there are regulatory consequences for individual aviators and their commanders. Below are extracts from AR 600-105.

• If an officer fails to remain professionally qualified or has marginal potential for continued aviation service, a flight evaluation board (FEB) should be convened to consider the case. An FEB will be convened under the conditions in (1) and (4) below.

...(1) *Lack of proficiency*. Evidence that shows the officer—

...(e) Failed to report for an annual flight physical examination, whether or not assigned to an operational flying duty position or meeting "gates."

...(4) *Insufficient motivation*.

...(f) Failure to maintain medical certification. An officer must maintain medical certification for flying duty through timely physical examinations (AR 95-1 and para 3-9, this AR). If the certification expires, he or she is unfit until medically requalified or a temporary medical extension is provided (AR 40-501). For active component officers, aviation service is suspended effective the day following the last day of his or her birthmonth....

What are the Solutions?

Several steps are necessary to solve this problem. Aviators who do not desire to remain in aviation service may request disqualification in accordance with AR 600-105. The following recommendations are offered to manage those who do not voluntarily request disqualification:

• Commanders must establish procedures for identifying nonoperational aviators assigned to their installations and/or for whom they have records' custodian responsibility. This can be done by having the local Adjutant General list all assigned officers who are in the Aviation Branch. This information is contained in the Standard Installation/Division Personnel Systems data base. The list can be scrubbed to identify those aviators who are assigned to an aviation duty position. All others are nonoperational aviators.

• Notify all assigned nonoperational aviators to present their IFRFs to either the aviation officer or the military personnel office. The commander must designate which office is the custodian.

• Establish a procedure to identify nonoperational aviators during inprocessing and instruct them to present their IFRFs to the designated custodian within 5 working days.

• Establish a suspense system to monitor when nonoperational aviators' flight physical examinations are due (within the 3-month period preceding the last day of the individual's birthmonth).

• Annually notify each nonoperational aviator of his or her requirement to complete the flight physical during the designated period. Instruct the aviator to present a DA Form 4186 reflecting his or her annual medical qualification to the custodian of his or her IFRF.

• Establish procedures for convening an FEB for those aviators who do not meet the annual flight physical requirement.

Conclusion

Nonoperational aviators are not meeting the requirements established in Army regulations. Individual aviators must comply with those requirements; commanders must evaluate the continued aviation service of those who do not comply with those requirements. The information attempts to clarify these responsibilities. It also educates aviators who may find themselves in a nonoperational aviator assignment as well as offers a solution to installation managers.

References

Field Manual 1-300, "Flight Operations and Airfield Management," chapter 7.

AR 95-1, "Army Aviation: General Provisions and Flight Regulations," paragraph 1-21.

AR 40-501, "Standards of Medical Fitness."

AR 600-105, "Aviation Service of Rated Army Officers," paragraphs 3-1, 3-5, 3-9 and 3-10.

AR 640-10, "Individual Military Personnel Records."

Field Circular 1-210, "Aircrew Training Manual, Commander's Guide," paragraph 2-23.

Department of the Army message DASG-PSP, 291800Z March 1984, subject: Use of DA Form 4186 for Nonoperational Aviators.

Commander, MILPERCEN (now TAPA) message DAPC-EPA-MP, 071530Z January 1986, subject: DA Form 3513, Individual Flight Records Folder, United States Army.

The UH-60 Black Hawk provides responsive MEDEVAC support.

Dustoff Europe
REORGANIZATION

Captain Timothy J. Moore
Aviation Officer Advanced Course 88-1
U.S. Army Aviation Center
Fort Rucker, AL

THE RADIO blares, "*Dustoff, Dustoff...*" The 421st Medical Company (AA) receives an urgent medical evacuation (MEDEVAC) request. The pilot in command checks the weather, files the flight plan and briefs the crew. Within minutes, a UH-60 Black Hawk is off on a lifesaving mission.

During peacetime, this scene occurs almost daily in the 421st. During wartime, MEDEVAC requests will be continuous. To improve support, the 421st (commonly called Dustoff Europe) is reorganizing under the Army of Excellence program into an evacuation battalion. The purpose of this article is threefold. It—

- Compares the present organization of Dustoff Europe with the new organization.
- Provides the reason for the proposed reorganization.
- Identifies possible problems that may occur with the reorganization and provides some recommendations to solving those problems should they occur.

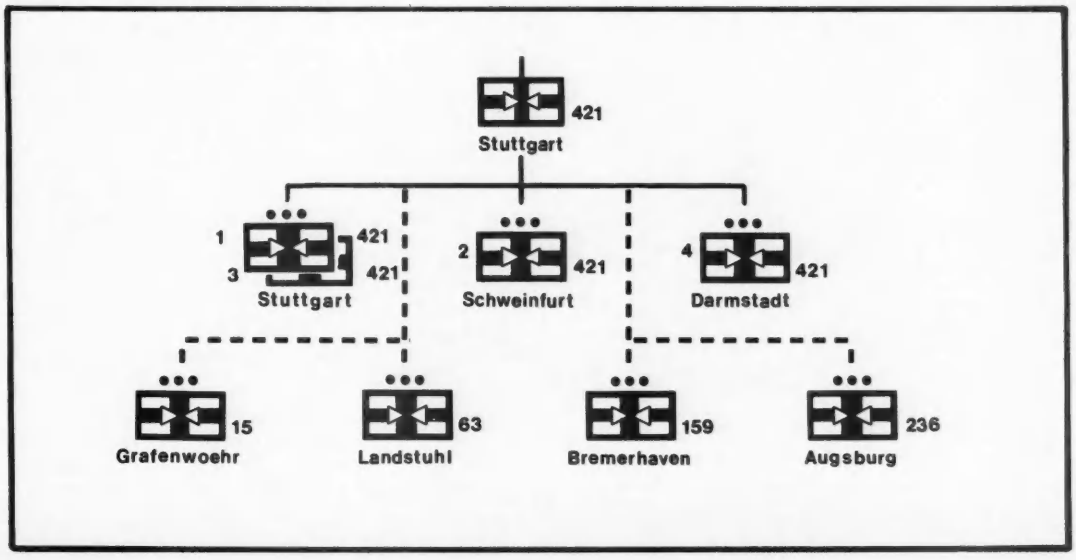
Dustoff Europe is organized into one 25-aircraft company and four 6-aircraft detachments. During peacetime, the headquarters provides command and control of the detachments; however, during wartime, the medical brigade of the corps' support command (COSCOM) will provide command and control of the detachments. Figure 1 shows the present command structure and the location of each unit.

Under the reorganization plan, Dustoff Europe becomes an evacuation battalion providing command and control for three 15-aircraft companies. These companies are similar in size and equipment to the combat assault company found in the aviation brigade. All aviation force structures are subject to congressional budget cuts and programed retirement of aging aircraft. Therefore, this planned structure may need further revision in the near future. Budget limits and retirements will reduce the total Army Aviation fleet from around 8,300 to 6,600 aircraft. This will likely necessitate alterations in unit size, design and structure. This battalion design may be unique only to forward-deployed forces in Europe.

The reorganization will occur in two phases. Phase one, completed in August 1987, produced a provisional battalion headquarters, two 15-aircraft companies and three 6-aircraft detachments (figure 2, page 32). In phase two, scheduled for fiscal year 1991, the remainding three detachments form the third company. Figure 3, page 32, shows the evacuation battalion organization.

Let's look at the reason for the reorganization. Quite simply, the evacuation battalion will solve the two major problems that presently exist in Dustoff Europe. The first, and most critical, problem is the command and control of the MEDEVAC detach-

FIGURE 1: 421st Medical Company (AA).



Dustoff Europe

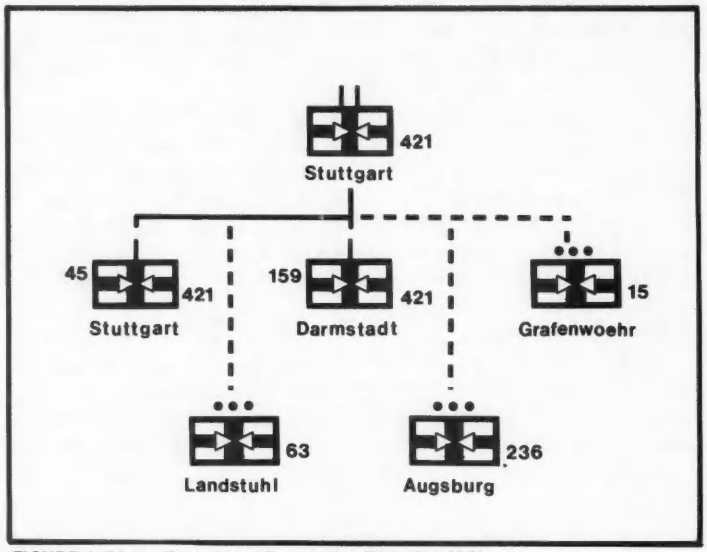


FIGURE 2: Phase One, 421st Evacuation Battalion (AA).

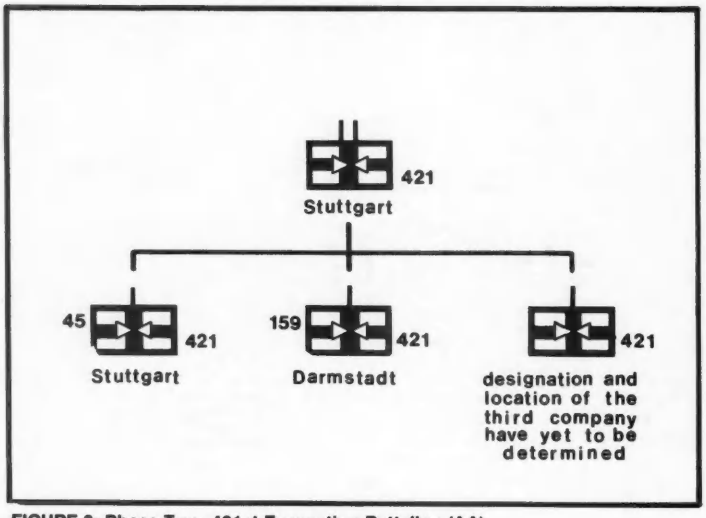


FIGURE 3: Phase Two, 421st Evacuation Battalion (AA).

ments in wartime. The second problem is the difficulty for the small units to conduct unit-level training. Let's look at these problems in more detail.

To understand the problem of command and control, it is necessary to understand current medical doctrine. If war were to occur tomorrow, the current COSCOM area MEDEVAC support is one 25-aircraft company and two 6-aircraft detachments for each division in the corps. This allocation presents a command and control problem at detachment level: there is no single manager of MEDEVAC assets.

Presently, a major commands each MEDEVAC detachment, and will allocate aircraft to meet the division needs. However, there are four brigades (including the aviation brigade) in a division and only two MEDEVAC detachments to support them. To adequately support each brigade, each MEDEVAC commander must split his unit.

Under the reorganization plan, the allocations of MEDEVAC units change. Now, the COSCOM area support is one 15-aircraft company for every two divisions. Additionally, one 15-aircraft company will support each division. Each company has three forward support MEDEVAC sections that consist of three aircraft each. One section will support a maneuver brigade from the brigade support area. The remaining six aircraft form an area support MEDEVAC section in the division support area and will support the rest of the division. The section also will provide additional forward support and reconstitution as necessary.

As the reader can see, the evacuation battalion solves the problem of command and control of MEDEVAC units supporting the division and corps area. Now let's look at the second reason for the Dustoff Europe reorganization, and that reason is the problem of unit-level training.

As figure 1 shows, Dustoff Europe previously was made up of separate

platoons and detachments located throughout Europe. These small units could not conduct unit training effectively because of limited personnel and equipment, as well as the units' mission constraints.

For example, a typical unit maintained 6 UH-60 aircraft and 4 wheeled vehicles with only about 30 people. Usually, one aircraft and one vehicle were inoperable because of maintenance. If the unit deployed to a field training exercise (FTX), one aircraft, a crew of four and two radio-telephone operators had to remain at home station for area MEDEVAC support missions. Thus, under normal circumstances, a unit could only deploy 4 aircraft, 3 vehicles and about 24 people. This is not the proper way to conduct training.

Compare the above example with the new company. This company has 15 aircraft, 10 vehicles and about 120 people. Using the same constraints on aircraft, vehicles and personnel, this company can deploy 14 aircraft, 9 vehicles and 124 people—a significant increase and the answer to solving the collective unit-level training problem.

Now let's look at the other side of the coin; specifically, what are the problems with the reorganization? The only major problem identified was the possible lapse in MEDEVAC coverage caused by any restationing actions. For example, what unit would provide coverage in the Schweinfurt area after the second platoon relocated to Stuttgart to form a new company?

Field siting aircraft is the answer to this problem. When the second platoon left Schweinfurt, the new company at Stuttgart was responsible for field siting an aircraft at the Giebelstadt Army Airfield. This airfield was in the same area as Schweinfurt and allowed no lapse in MEDEVAC coverage to occur. Dustoff Europe will field site aircraft in all areas where MEDEVAC units were stationed, including the two major ranges in Germany: Hohenfels and Grafenwohr.

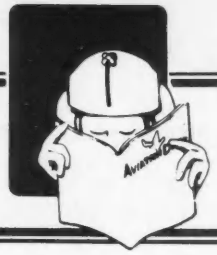
What are the conclusions that can be drawn from the Dustoff Europe reorganization? First, the evacuation battalion and its assigned 15-aircraft companies provides superior command and control during wartime especially at division level where there is now one commander in charge of all the MEDEVAC assets supporting that division. Also, aircraft located forward in the brigade support area provide more responsive MEDEVAC coverage.

Second, the reorganization enhances the unit-level training status of the MEDEVAC company. A unit now has sufficient personnel and equipment to provide MEDEVAC coverage at home station as well as conduct meaningful FTXs and combat training.

The Dustoff Europe reorganization is an important enhancement to combat readiness that will allow MEDEVAC aircraft to continue providing an important service to the soldier—**Dedicated Unhesitating Service To Our Fighting Forces.**

MEDEVAC of an injured troop in a UH-60.

VIEWS FROM READERS



Editor:

I read the article, "The New Combat Lever—Space," by CPT James S. Marrs, in the December 1987 issue of *Aviation Digest* and found it extremely interesting.

I am an 11B, SP4 with the 101st PFDR Det, 2/17th Cav, at Ft. Campbell, KY. I enjoy my job, but my real interest is space. I would like to get as much information as possible concerning the Army's role in space or anything about space at all. Of course I would like to know a point of contact, perhaps some office or person in charge. I am up for reenlistment in the next 6 months so I'm checking all my options.

Thank you for any cooperation. It is very important to me to be part of the next generation for the development in space.

SP4 Charles E. Pittman
Ft. Campbell, KY

• The *Aviation Digest* received the following response from the Directorate of Combat Developments, Ft. Rucker, AL, to SP4 Pittman's inquiry:

In December 1986 B. Bruce Briggs wrote, in the *Military Review*, "the role of the Army in space is already evident—it has no role." This declaration is totally without basis in 1988. The Army Space Command and the Army Space Institute are established organizations that have begun to affect the Army's ability to execute any mission during any form of conflict. Across the Army the benefits of space-related systems are being felt in communications, environmental and navigational enhancements. Unfortunately, there is no military occupational specialty designation for the enlisted soldier. The officer may attain an additional identifier of 3Y if he meets certain educational requirements. For more information on this matter, contact the Chief of Personnel Proponency at the Army Space Institute, Major Linda Ewing, AUTOVON 552-4325/3039.

Editor:

In his article, "Standardization [of Cockpit Controls]," which appeared in the April 1988 issue of the *U.S. Army Aviation Digest*, Mr. Steelman has done an excellent job of highlighting much of the nonstandardization that exists in the current fleet aircraft, as well as some of the resultant impacts. Those of us who are involved in human factors engineering and crewstation design have been strong advocates of standardization. We realize the benefits to be gained from a positive transfer of training and reduced cognitive demands on the aircrew.

The impression created by Mr. Steelman is that the crewstation design process is conducted without attempts at standardization or, perhaps, that the appropriate standardization mechanisms do not exist. The reader may be misled into thinking that there is no formalized approach aimed at crewstation standardization.

To the contrary, there are a number of military specifications and standards directly related to crewstation design, location of switches and panels, nomenclature, and even cyclic grips. Among these are MIL-STD-203, 250, 411, 783, 850, 1333 and 1295 as well as MIL-G-58087.

Within the United States, there exists an Aircrew Station Standardization Panel (ASSP) whose main focus is updating existing and/or generating new specifications and standards related to the crewstation. This panel is made up of representatives of the three services as well as industry. Furthermore, there are two international standardization groups (Air Standardization Coordinating Committee Working Party 10 and NATO Aircraft Displays and Aircrew Station Working Party) with similar goals.

The mechanisms for crewstation standardization exist. Perhaps, a more appropriate question to raise is why these standardization documents were not more strongly invoked during the development phase. All of the recent aircraft development programs (AH-64, UH-60, OH-58D) have called out the appropriate standards; however, the contractor was later granted a deviation from the requirements. Some of the deviations made sense and addressed limitations in the standards; yet others seem to have had no foundation at all except that somebody wanted it that way. In all fairness, at times that "somebody" was an Army pilot who had his own conceptions of how things should be. One has to realize that with every deviation granted, some degree of standardization will be lost.

Mr. Steelman's article has provided some interesting food for thought. Hopefully, the above information helps to present a more complete picture. Rest assured that those of us in the aviation human factors engineering discipline will continue to strive for and promote crewstation standardization.

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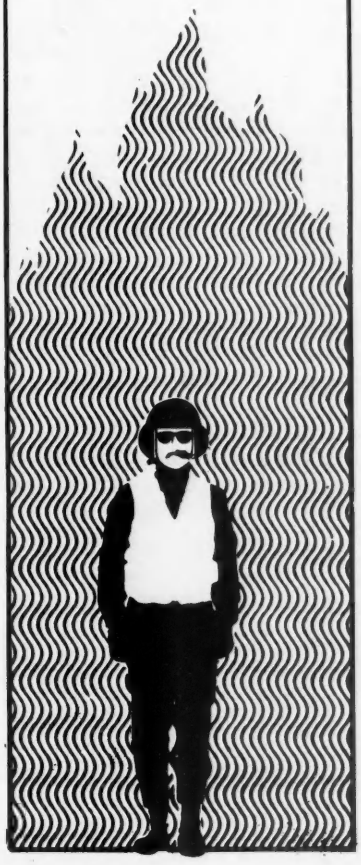
The opinions expressed in this article are those of the authors and do not necessarily reflect the views of any Department of Defense agency.



Interim Protected Aviator Thermal Stress Index

ARMY AVIATION conducts comprehensive training in chemical defense (CD) ensembles. These ensembles interfere with normal body cooling when worn during hot weather and may cause heat casualties. Current guidelines curtail training when the wet bulb globe temperature (WBGT) exceeds 23.8 degrees centigrade (C) (75 degrees Fahrenheit (F)). This article proposes interim heat stress training guidelines for aviators who are protected from chemical attack in the current U.S. CD ensembles.

Through extensive study heat stress is known to affect the psychomotor skills, cognitive functions and judgment of stressed individuals.[1,2] The conditions that cause heat stress are known to exist in helicopters at certain times; however, the role of heat stress in Army Aviation accidents is not known conclusively.[3] Most helicopters in the current inventory can be flown with the doors open or removed; therefore, heat stress has probably not had an extensive impact on Army Aviation. This "open" mode allows a high rate of airflow and, therefore, good convective cooling. Some aircraft, such as the AH-1S Cobra, require all doors to be closed to take advantage of aerodynamic principles. Heat loading due to "greenhouse" effects has driven cockpit temperatures up to the point at which an environmental control unit had to be installed on the AH-1S.

Concern over the possible effects of heat stress has increased because of recent threat analysis that states enemy forces may employ chemical warfare weapons. Current doctrine relies on wearing bulky and hot protective ensembles to counter the projected or actual use of these weapons. These ensembles are laminates of foam and activated charcoal; they exacerbate heat stress, perhaps to the point of posing serious safety hazards. Current CD training guidelines require each aviator to be able to fly proficiently in CD ensembles up to 6 hours; however, these guidelines curtail training when the WBGT exceeds 23.8 degrees C (75 degrees F). While this is a conservative

[1] Poulton, E.C. 1976. Arousing environmental stresses can improve performance, whatever people say. *Aviation, Space, and Environmental Medicine*. 47(11):1193-1204.

[2] Wing, J.F. 1965. Upper thermal tolerance limits for unimpaired mental performance. *Aerospace Medicine*. 36:960-964.

[3] Breckenridge, J.R. and Levell, C.A. 1970. Heat stress in the cockpit of the AH-1G HueyCobra helicopter. *Aerospace Medicine*. 41(6):621-626.

PATSI *continued*

and safe guideline, it means that training may be seriously hampered.

For instance, at Ft. Rucker, AL, and Ft. Hood, TX, mean daily temperatures from April through October exceed guidelines. At Ft. Kobbe, CZ, daily temperatures exceed training guidelines year round. Current training goals could be met better if a practical guideline could be used in place of current restrictions. This guide is one that would relate temperature and humidity, the primary determinates of heat stress, to the danger of heat stress.

For many years U.S. Air Force (USAF) aircraft have had large areas of glass and restricted airflow. The USAF has developed guidelines to predict the degree of heat stress imposed upon standard flight gear (lightly clothed) aircrews flying high-performance aircraft at low levels. These guidelines are found in the North Atlantic Treaty Organization (NATO) Air Standardization Coordinating Committee (ASCC) literature.[4] They are the only heat stress control guidelines currently available.

This article describes the relationship between ground temperature, humidity, measured cockpit temperature and measured airflow through the cockpit. In-flight cockpit temperatures (fighter index of thermal stress (FITS)) are predicted from information (ground temperature and dewpoint) normally contained in weather briefings. The guideline defines three zones of stress for troops wearing standard flight gear (light clothing): Normal, caution and danger.

The normal zone is any FITS temperature up to 32 degrees C (89.6 degrees F). Flights conducted in the normal zone should be considered as having low risk of heat stress. Any flight conducted in the FITS temperature range of 32 degrees C (89.6 degrees F) to 38 degrees C (100.4 degrees F) range should be considered as being in the caution zone. Flights are permissible if adequate precautions are taken. To preclude subtle performance impairments flights should be held to less than 90 minutes. Postflight recovery should continue for 2 hours with ample palatable fluids available in cool recovery areas. Forcing fluids is recommended. Detailed information on precautions and preventive measures is available in both NATO and U.S. Army literature on heat stress.[5,6]

Should the FITS temperature reach 46 degrees C (114.8 degrees F), or above, nonessential flights should be canceled. As noted in the guidelines, the table provided to quickly relate ground temperatures and dewpoint to FITS temperature is for pilots wearing standard flight gear (figure 1). The FITS temperature for a particular flight is determined by locating ground temperature (say 40 degrees C or 104 degrees F) in the left-hand column of figure 1 and moving horizontally to the dewpoint column (say 20 degrees C or 68 degrees F). The number at that location is the estimated FITS temperature for low-level operations, in this example 41 degrees C (105.8 degrees F). This temperature is in the danger zone, and appropriate precautions should be taken.

If dewpoint is unavailable, it can be estimated by subtracting 20 degrees C from the ground temperature (30 degrees C if in a dry area) during the summer and 10 degrees C (20 degrees C in dry areas) during the winter. The more humid the day, the closer the dewpoint is to ambient temperature.

However, a problem arises when aviators are clad in CD ensembles; the FITS heat stress guidelines no longer apply. An interim training guideline for helicopter operations while wearing CD ensembles, therefore, is proposed in figure 2. It is based on the ASCC FITS guideline. The proposed interim protected aviator thermal stress index (PATSI) is a lowering of the allowable cockpit temperatures, which considers the reduced thermoregulatory ability of aviators wearing CD ensembles. It is designed for use by young, physically fit, acclimated aviators. Older and heavier aviators should be considered as being at increased risk of heat stress.

A heat stress literature review reveals the best estimate of the temperature at which a lightly clothed man starts to evidence performance decre-

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[4] NATO. 1981. Guidance for the control of heat stress in operations of high performance military aircraft. ASCC. Advisory publication 61/9. Naval Publications and Forms Center, Philadelphia.

[5] Department of the Army. 1980. Prevention, treatment and control of heat injury. Washington, DC: Department of the Army. TB MED 507.

[6] NATO. 1981.

Figure 1: Fighter Index of Thermal Stress in Degrees C (low-level flight, clear sky to light overcast).

***Instructions*: Enter with local dry bulb temperature and dewpoint temperature; at intersection read FITS value (degrees C) and zone. Applies only to lightweight flight clothing. See notes for zone explanation. The solid block area denotes combinations above saturation temperature.**

	dry bulb temperature in degrees centigrade [C] & Fahrenheit [F]		dewpoint temperature in degrees centigrade [C] and Fahrenheit [F]									
			<0 C <32 F	5 C 41 F	10 C 50 F	15 C 59 F	20 C 68 F	25 C 77 F	30 C 86 F	35 C 95 F	40 C 104 F	>45 C >113 F
NORMAL ZONE	20.0 C	68 F	21	22	24	26	29					
	22.5 C		23	24	26	28	30					
	25.0 C	77 F	24	26	27	29	31	35				
	27.5 C		26	27	29	31	33	36				
	30.0 C	86 F	28	29	31	32	35	37	41			
	32.5 C		29	31	32	34	36	39	42			
	35.0 C	95 F	31	32	34	36	37	40	43	46		
CAUTION ZONE	37.5 C		33	34	35	37	39	42	45	48		
	40.0 C	104 F	34	35	37	39	41	43	46	49	52	
	42.5 C		36	37	38	40	42	44	47	50	54	
	45.0 C	113 F	37	39	40	41	43	46	48	52	55	58
DANGER ZONE	47.5 C		39	40	41	43	45	47	50	53	56	59
	50.0 C	122 F	41	42	43	44	46	48	51	54	57	61

SATURATED

NORMAL ZONE

CAUTION ZONE

(1) Be aware of heat stress.

(2) Limit ground period (preflight and ground standby to 90 minutes).

(3) Minimum 2-hour recovery between flights.

DANGER ZONE

(1) Cancel low-level flights [below 915 m (3,000 feet) above ground level].

(2) Limit ground period to 45 minutes.

(3) Minimum 2-hour recovery between flights.

When value is greater than 46 degrees C, cancel all nonessential flights.

Figure 2: Protected Aviator Thermal Stress Index In Degrees C (low-level flight, clear sky to light overcast).

***Instructions*: Enter with local dry bulb temperature and dewpoint temperature; at intersection read PATSI value (degrees C) and zone. Applies only to chemical defense flight clothing. See notes for zone explanation. The solid black area denotes combinations above saturation temperature. Temperatures that do not appear in the table should be increased to the next higher temperature listed.**

	dry bulb temperature in degrees centigrade [C] & Fahrenheit [F]		dewpoint temperature in degrees centigrade [C] and Fahrenheit [F]									
			<0 C <32 F	5 C 41 F	10 C 50 F	15 C 59 F	20 C 68 F	25 C 77 F	30 C 86 F	35 C 95 F	40 C 104 F	>45 C >113 F
NORMAL ZONE	10.0 C	50 F	14	15	17	19	22					
	12.5 C		16	17	19	21	23					
	15.0 C	59 F	17	19	20	22	24	29				
	17.5 C		19	20	22	24	26	30				
	20.0 C	68 F	21	22	24	26	29	31	35			
	22.5 C		23	24	26	28	30	33	36			
	25.0 C	77 F	24	26	27	29	31	35	37	41		
CAUTION ZONE	27.5 C		26	27	29	31	33	36	39	42		
	30.0 C	86 F	28	29	31	32	35	37	41	44	47	
	32.5 C		29	31	32	34	36	39	42	45	49	
	35.0 C	95 F	31	32	34	36	37	40	43	46	49	52
DANGER ZONE	37.5 C		33	34	35	37	39	42	45	48	51	54
	40.0 C	104 F	34	35	37	39	41	43	46	49	52	56

SATURATED

NORMAL ZONE

CAUTION ZONE

(1) Be aware of heat stress.
(2) Limit ground period (preflight and ground standby to 90 minutes).
(3) Limit flights to a single fuel load.
(4) Minimum 2-hour recovery between flights.

DANGER ZONE

(1) Cancel low-level flights [below 915 m (3,000 feet) above ground level].
(2) Limit ground period to 45 minutes.
(3) Limit flights to 2 hours.
(4) Minimum 2-hour recovery between flights.

When value is greater than 41 degrees C, cancel all nonessential flights.

PATSI *continued*

ments for a job in which two tasks are to be attended to simultaneously. This temperature is 32.2 degrees C (90 degrees F).[7,8]

A soldier in a protective ensemble will start to demonstrate performance decrements at temperatures in excess of 21 degrees C (69.8 degrees F) in current Army doctrine.[9] This temperature is based upon data that are not as extensive as that for lightly clothed men; however, these data are considered adequate for the proposed interim guideline. Supporting information for the selection of this temperature will be presented. Accepting these two temperatures as valid is the first assumption being made in the proposed PATSI. The second assumption is that these two temperatures represent for the respective clothing conditions the same theoretical point; namely, that at which performance is beginning to be degraded subtly. The third assumption is that the difference between the two temperatures of 11.2 degrees C (32.2 degrees - 21 degrees = 11.2 degrees) is attributable to wearing the U.S. CD ensemble. The final assumption is that the point in the PATSI guidelines at which subtle performance decrements start for the encumbered soldier is the same conceptual point identified above for a lightly clothed one.

The FITS is notified by moving the cutoff temperatures for caution and danger zones from 35 degrees C to 25 degrees C (caution) and from 45 degrees C to 35 degrees C (danger). This reflects about 11.2 degrees difference in the start of performance decrements already computed. Loosely, the modification to the FITS states that the effect of wearing the U.S. CD ensemble is about the same as that seen in men who are not wearing the ensemble; these same men are in ambient temperatures that are an additional 10 degrees C warmer.

This modification does not correct for varied airflow through the different helicopter configurations. Nor does it correct for the fact that the water vapor permeability of the CD ensembles is less than in standard flight suits and is an additional burden to the encumbered aviator. However, the PATSI guideline is thought sufficiently conservative to generally gauge the probability of heat stress despite these shortcomings.

While admittedly an interim solution, PATSI is recommended because of a number of things. First, the FITS from which it was adapted has been available for some time. It is accepted as an ASCC standard.

Second, FITS is based on what little empirical data are available for performance in U.S. CD ensembles. FITS is also based on a great deal of experimental literature on heat stress.

Third, it puts the beginning of the caution zone at about the same point as current training guidelines do; namely, 23.8 degrees C (75 degrees F). This temperature is an independent best guess at the upper limit of unimpaired flight.

Fourth, a U.S. Army Aeromedical Research Laboratory (USAARL) at Ft. Rucker study evaluated physiological effects of heat stress induced by U.S. CD ensembles.[10] In that study, the temperatures recorded during flights placed the aviators at the border between caution and danger. In fact, half of the flights in the U.S. CD ensemble were terminated because of exceeding heat stress safety limits.

Fifth, in a related study, also conducted by USAARL, those same aviators as in the first study who exceeded safety criteria also exhibited short-term deficits in their cognitive functioning.[11]

Sixth, in a 1983 study, a difference in cognitive function was noted between subjects wearing the U.S. CD ensemble in temperatures above and below 24 degrees C.[12] This is about the temperature used to delineate the breakdown of performance as cited above by the Army.[13]

Finally, it is considered the most comprehensive guideline that is currently available to the aviator who must wear chemical protective ensembles in hot environments.

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[7] Hancock, P.A. 1982. Task categorization and the limits of human performance in extreme heat. *Aviation, Space and Environmental Medicine*. 53(8):778-784.

[8] Wing, J.F. 1965.

[9] Department of the Army. 1977. NBC (nuclear, biological and chemical) Defense. Washington, DC: Department of the Army. FM 21-40.

[10] Knox, F.S., Nagel, G.A., Hamilton, B.E., Olazabel, R.P. and Kimball, K.A. 1982. *Physiological Impact of Wearing Aircrew Chemical Defense Protective Ensembles While Flying the UH-IH in Hot Weather*. Ft. Rucker, AL: U.S. Army Aeromedical Research Laboratory. USAARL 83-4.

[11] Hamilton, B.E., Simmons, R.R. and Kimball, K.A. 1982. *Psychological Effects of Chemical Defense Ensemble Imposed Heat Stress on Army Aviators*. Ft. Rucker, AL: U.S. Army Aeromedical Research Laboratory. USAARL 83-6.

[12] Hamilton, B.E. and Zapata, L. 1983. *Psychological Measurements During the Wear of the U.S. Aircrew Chemical Defense*. Ft. Rucker, AL: U.S. Army Aeromedical Research Laboratory. USAARL 83-7.

[13] Department of the Army, 1960.

Major Kenneth R. Brown

Make These Instruments Read Right

A Spatial Disorientation Primer

WE WERE RETURNING to the airfield on a routine service mission in instrument flight rules (IFR) conditions. It had been a long day. The combination of poor weather, delays and the long hours were beginning to have an effect on me and my crew. I was looking forward to getting home, putting my feet up and having a cold drink with the boys. But I told myself, "First things first, let's deal with this weather." The weather was marginal but above minimums. The controller reported it as 800 overcast with 1-mile visibility, light rain and fog. No problem, I said to myself. I must have flown this approach a hundred times. It's become almost routine. I know the headings, intercept altitudes and decision height almost by heart.

Five minutes from a cold beer and a war story at the club, air traffic control (ATC) directed us to hold over the final approach fix. The deteriorating weather conditions apparently caught up with several training aircraft all returning at the same time. These conditions caused us to be stacked up in holding. But hey—no problem, I can handle it. After several trips around the

holding pattern, our frustration and fatigue levels began to settle in. Finally! It was our turn as ATC cleared us for the approach. I was beginning to taste that cold beer. Just one more turn inbound, pick up the localizer and glide slope and we'll practically be home. As I rolled into the turn, I decided to take a quick look at the approach plate, just in case. I quickly leaned over, turned my head to reach into the publications bag and, just as quickly, experienced a terrible spinning sensation. It felt like we were tumbling head over heels. Attempts at leveling the aircraft only seemed to make matters worse. Before we lost control of the aircraft completely, the copilot took the controls and eventually recovered the aircraft. What happened to me?

As the pilot in this incident, I was experienced, motivated and familiar with the mission and design of the aircraft. I was both current and proficient in instrument flying. But I allowed conditions that can include physical and mental fatigue, acute emotional stress, and possible complacency and overconfidence, to compromise my experience level. Thus, I became spatially disoriented—a victim of the coriolis illusion. Luckily in this incident, the copilot was able to take the controls, and the mission was completed without further incident.

Aircraft accident reports are full of unexplained tragedies. For example, an OH-58 Kiowa pilot flew into deteriorating weather conditions, went inadvertently instrument meteorological conditions (IMC), became spatially disoriented and crashed. An AH-1S Cobra pilot, conducting a night fire training mission, while concentrating on the rockets, hit the target, allowed the aircraft to drift into trees and subsequently crashed. During a troop insertion the crew of a UH-60 Black Hawk, number three in a flight of five, encountered a "white out" condition over sloping terrain. This condition resulted in the aircraft laying on its left side, causing major damage and injuries to crewmembers.

Many aviators firmly believe that spatial disorientation is simply not a threat to them because of the experience level. The truth is that no one is exempt, regardless of aeronautical rating, flight experience or job title. In fact, FM 1-301, "Aeromedical Training for Flight Personnel," states that spatial disorientation contributes more to aircraft accidents than any other physiological problem in flight. Spatial disorientation has claimed the lives of 80 U.S. Army Aviation crewmembers since 1972. It is a constant threat to aviation safety. The aviator must be constantly aware of it.

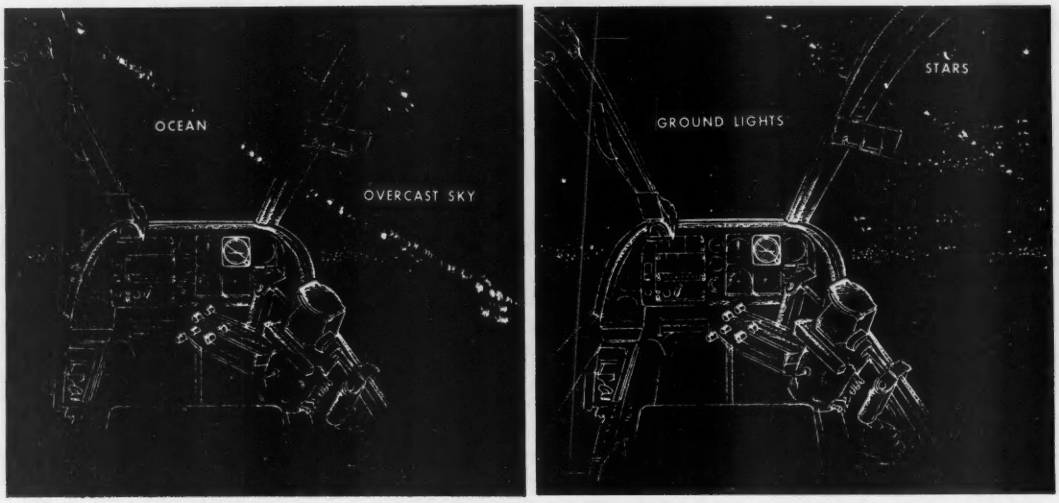
The human body perceives changes in movement on land in relation to the center of the earth. In an aircraft, however, the ordinarily fine balance between the human sensory systems—the visual system, vestibular system and the proprioceptive system (nonvestibular proprioceptors, "seat of the pants")—can be easily disrupted by erroneous orientation information.

Of the three sensory systems, the visual sense is the most important sense used in flying an aircraft—something every pilot knows. Unfortunately, while our aircraft get both faster and technologically more advanced, our eyes fail to keep pace with technology. We're forced to rely on a system designed for earth-bound purposes at slow speeds. But the eyes are only one component of the visual system and only part of the problem. The brain receives its information from the eyes and attempts to synthesize all the data and tell us what we see. Here's where the problems develop.

The pilot's perception of what he sees is affected by many things: weather, terrain, the runway environment, and his experience and proficiency levels. The combination of all these factors influences what the pilot's brain "sees." Few pilots have not experienced at least one or more of the confusing visual illusions. Let's examine

False vertical and horizontal cues.

illustration by Charles "Britt" Britton



Visual illusions: blending of ground, or water, and overcast sky (left) and confusion of ground lights with stars (right).

a few of the most common visual illusions that occur.

Relative motion is a common illusion in formation flight in which the pilot interprets movement of another aircraft as his own motion. For example, have you ever been waiting at a stop light and have the sensation of motion produced as the car next to you creeps forward? It may give you the sensation of movement to the rear. Your first response may be to jam on the brakes though you're not moving at all. It also can be induced in a helicopter crew while hovering over tall grass. It may be impossible to find a reference point to maintain a steady hover because of the waving motion of the grass. This illusion is even more pronounced in an aviation environment since there are few stable external reference points.

Have you ever confused a stratus cloud layer with the horizon—thinking it was flat? False vertical and horizontal cues often cause problems when the pilot is flying over or toward a sloping cloud layer or gently sloping terrain. He may feel compelled to adjust his wing attitude to match the sloping horizon.

Blending of the earth and sky often occurs on especially dark nights when lights from the stars are indistinguishable from ground lights. It also occurs on overcast nights when there are no ground lights, such as over the ocean or remote desert areas, to help gain horizontal orientation. Some aviation crews have become confused, thought they were in an unusual attitude and attempted to correct the sensation without referring to their flight instruments. You and I both know that most helicopters don't fly too well upside down although some have tried.

How many times have you seen other air traffic at night only to realize that you were focusing at a star? Autokinesis is the false perception that a dim, stationary light is moving. When staring at such a moving light for several seconds, the eyes attempt to compensate by making searching movements to gain adequate reference points. This provides the brain with erroneous information. Every good pilot knows that this effect can be diminished primarily by a good visual scan.

Flicker vertigo, though not a major problem in Army Aviation, can be temporarily disabling. Lights that flicker at a rate of 4 to 20 cycles per second through a propeller or rotor system, and from the reflection of anticollision lights while in IFR conditions, can induce nausea, vomiting and, in rare cases, seizures and unconsciousness.

Fascination in flying, although not strictly an illusion, is a form of disorientation. This is because the pilot's attention is diverted to a task unrelated

Autokinesis.

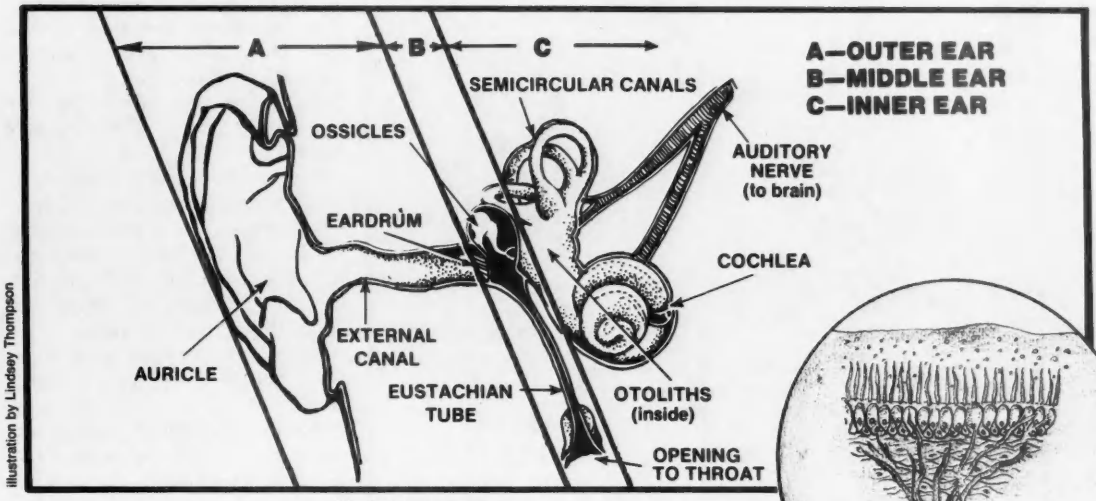
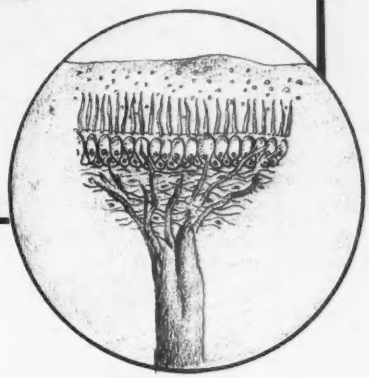


illustration by Lindsey Thompson

Vestibular system.



Otolith organs.

to flying the aircraft. A classic example of fascination is target hypnosis in which the pilot becomes so intent on hitting the target that he forgets to fly the aircraft. In some cases, he delays his pullout too long and crashes into the target area. It doesn't just happen to you gun pilots though. Believe it or not, we're all subject to a poor instrument cross-check at times, which is another good example of fascination in flying.

The vestibular system—the inner ear, including the semicircular canals and the otolith organs—also provides spatial orientation. Angular acceleration (rotational motion) about the three axis of the aircraft stimulate the semicircular canals. Linear acceleration both in the horizontal and vertical planes stimulates the otolith organs. About 20 to 30 seconds after a constant velocity is established, as in constant rate turn, these organs become accustomed to the new orientation and register it as the norm. They're now reset to receive new information, which can lead to several vestibular forms of spatial disorientation. Flight in IMC, a poor instrument cross-check or a lack of trust in flight instruments will make the individual much more susceptible to the vestibular illusions described in the following paragraphs.

I'm sure that most of you aviators have experienced the "leans," whether you'll admit it or not. The leans is the most common form of vestibular illusion. It can occur when the pilot fails to perceive angular motions during maneuvers below threshold stimulation levels of the semicircular canals. These motions are often unintentional as in a very slow rate of turn, for example. A sudden attempt to return the aircraft to level flight results in a false sensation of bank. It's called the leans because the pilot attempts to compensate for this sensation by aligning his body in the direction of the original roll.

The coriolis illusion is a more dangerous illusion. It is also caused by the vestibular system becoming accustomed to turning or rotational motion. During a prolonged coordinated turn, the fluid in the semicircular canals, which are initially stimulated, attains a constant speed. The sensation of motion ceases. If the pilot then moves his head so that the semicircular canals are placed in a different geometric plane, such as turning his head to tune a radio, he can sense rotation or movement in all three axis of the aircraft at once. This effect of combined turning sensations can be quite overwhelming. It can result in unpredictable attitudes when the pilot attempts to correct what he perceives as uncontrolled rolling, turning or spinning by making additional radical control movements.

The oculogravic illusion is interesting. It results from the body's normal compensatory mechanisms. You may have to concentrate closely to understand this one. During unexpected downward accelerations, as in a severe downdraft or upon entering autorotation, the otolith organs are stimulated. This increase in negative G force elicits a vestibular-ocular reflex. This reflex drives the eyes upward as the body goes through a transitory period of

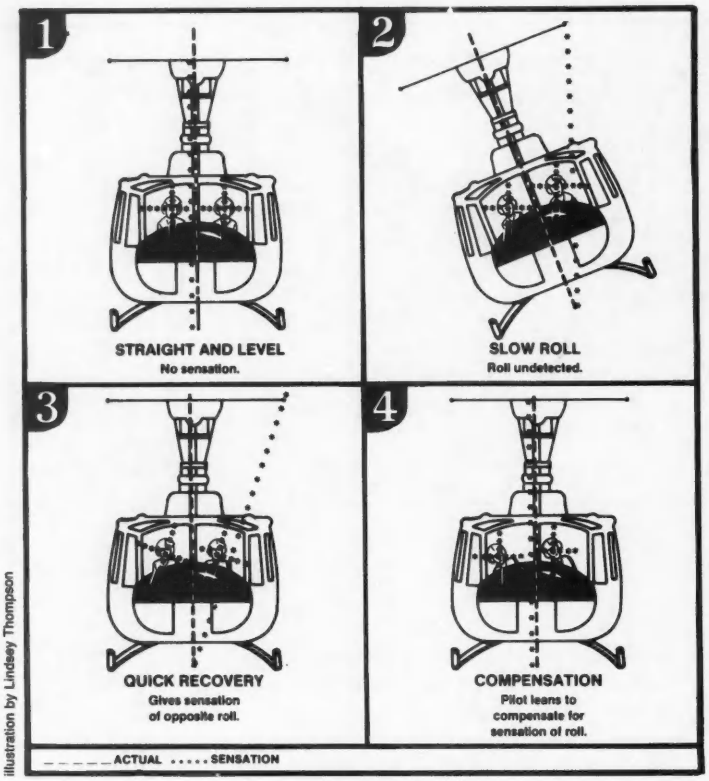


illustration by Lindsey Thompson

The "leans."

weightlessness. If the pilot attempts to visually stabilize objects that are in a fixed position relative to him, such as the instrument panel, this can cause those objects to appear to shift downward. The pilot may feel that aft pressure on the controls is necessary to correct for this sensation. The elevator illusion, caused usually by an updraft, has the opposite effect as one is accelerated upward.

The oculogravic illusion can occur during level forward acceleration; it results in a false sensation of a nose-high attitude. Caused by stimulation of the otolith organs, this illusion can be dangerous to the pilot when taking off in conditions of low visibility and when performing go-arounds or missed approaches in IFR conditions with a weak instrument cross-check. This illusion is dangerous because the pilot may respond to the sensation of a nose-high attitude by pushing the nose of the aircraft down while at low altitude. The accelerative force required to generate this illusion is relatively low, making all pilots, rotary and fixed wing, susceptible.

The visual and vestibular systems play dominant roles in spatial orientation. Although this is true, the contributions of the proprioceptive system (seat-of-the-pants) to proper orientation cannot be overlooked. This subject can be complex, but what it basically amounts to is that the sensory nerve endings in the muscles, tendons and joints provide orientation cues by sensing the forces applied to our bodies during flight. In flight, this system supports or verifies sensations derived from the vestibular system, whether accurate or erroneous.

Prevention of spatial disorientation must be a constant effort. The pilot must—

- Transition to instruments as soon as his visibility starts to diminish.
- Rely on the visual sense instead of the vestibular or proprioceptive systems regardless of the sensations felt.
- Not mix instrument flying with visual flight rules conditions.
- Maintain instrument proficiency.
- Limit physical and emotional stress.
- Remain particularly vigilant during high-risk conditions such as darkness and low visibility.

Overcoming disorientation requires concentration, composure and intellectual control of the aircraft despite what might be very strong distractions. The pilot must believe in the instruments. This point cannot be emphasized enough. Remember that only the visual sense is reliable in flight. Avoid further distractions, maintain a proper cross-check and limit head movements. Of course in multiseat aircraft, the copilot should take the controls if he is unaffected. Remember the main objective in overcoming spatial disorientation is to make those instruments read right!

ABOUT THE AUTHOR

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ATC FOCUS
U.S. Army Air Traffic Control Activity

From Concept to Reality

Mr. Frank Dennis
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THE U.S. ARMY Air Traffic Control Activity (USAATCA) receives many inquiries. One of the most common is, "When am I going to receive the piece of equipment I requested last month?" USAATCA constantly attempts to improve the acquisition and fielding process to accommodate the user's requirements for air traffic control (ATC) equipment. Acquisition and fielding is a complicated process with many different players crossing major Army command (MACOM), Department of Defense (DOD) and Department of Transportation lines.

ATC requirements are identified primarily in two ways. First, the user determines a deficiency exists that affects ATC operations from either or both an operational or safety standpoint. This method of identifying a requirement is termed "bottom driven." The second is called "top driven." This method identifies programs mandated by DOD to meet life cycle, interface, operational or standardization requirements for ATC equipment. The first method is obviously of greatest interest to the local facility chief and ATC personnel.

The bottom-driven request consists of the local facility chief identifying a deficiency and requesting that a "fix" be applied to the problem. A facility's request, the formal document to initiate a project, is sent through the MACOM in accordance with the "how to guidance" to USAATCA. The facility's request is then processed by the Development Office, Requirements Division. The Requirements Division normally schedules a site visit to the requesting facility to validate the user's requirement and to coordinate with local officials who will be involved in the project. After the site requirement survey is completed, which includes recommendations, it is returned to the MACOM and the local facility to allow for comments and concurrences. The MACOM and facility are allowed 60 days to comment on the recommendations. When comments and concurrences are received, the site requirement survey is forwarded to the Programs Division so that a project can be initiated.

The Programs Division prepares a project initiation request and forwards it to the Project Manager (PM), Transmission Systems, Ft. Monmouth, NJ. The PM will oversee the project through acquisition, engineering, installation, test and acceptance.

Top-driven requirements are processed much the same way as the bottom-driven ones, except that top-driven requirements usually involve a large group of facilities; e.g., life cycle replacement of nondirectional beacons. The integration of many areas is considered during the planning process. One of the most important areas of consideration during the implementation phase of a project is budget planning.

The budget planning process is a multilevel, complicated and lengthy process that requires constant attention and coordination between participants at each level. The process falls into three major categories: major construction, Army; aircraft procurement, Army (APA); and operation and maintenance, Army (OMA). USAATCA plans and programs for APA and OMA requirements necessary to meet each program. The planning and programing process may take from 1 to 2 years to accomplish. Once funding is secured, the PM will implement the various phases of a project.

The PM procures hardware and software for each project by contracting with industry or by joint acquisition with other military services or the Federal Aviation Administration. The various phases of the management process are time consuming and require the constant attention of each MACOM action officer and the project manager. The PM has tasking authority over various support agencies and coordinates the overall management of the project. Depending on the scope of the project, this process can require from 90 days to 5 years or more to complete.

Remember, the more complex the project, the longer it will take to accomplish and satisfy the user's requirement. USAATCA seeks the cooperation and patience of each participant in the ATC acquisition process. The Air Traffic Control Activity exists to represent the user's needs.

Readers are encouraged to address matters concerning air traffic control to:
Commander, USAAVNC, ATTN: ATZQ-ATC-MO, Fort Rucker, AL 36362-5265

- Aviation Medicine—Its Origins and a Training Perspective
- AMEDD Aviation Update
- Dustoff Europe Reorganization